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**DATA ON THE ORTHOPTERAN FAUNISTICS OF EASTERN PENNSYLVANIA
AND SOUTHERN NEW JERSEY.**

BY HENRY FOX.

In the period from 1908 to 1912, inclusive, I collected Orthoptera extensively in various parts of the area here under consideration, spending as much time in the field as I could spare from other duties. During that time I accumulated data on the regional and habitat distribution of various species of *Acrididæ* and *Locustidæ*, which, although admittedly incomplete, suggest at least the general lines along which the study of such problems may ultimately be developed. In this study I endeavored to ascertain, in the first place, the exact areal distribution of each species and, secondly, the kind of environment in which it normally or prevailingly occurs.

The present paper is based upon the results of my own field observations, but to make it as complete as possible I have freely availed myself of all available sources of information and have frequently included data gathered by others, due acknowledgment of which I have endeavored to make in every case. In this connection I have found the distributional data given in the new N. J. State Report on insects¹ especially valuable. I am also under obligations to Mr. James A. G. Rehn and Mr. Morgan Hebard for generously placing their local collections and those of the Academy of Natural Sciences of Philadelphia at my disposal and for permission to use the data so obtained.

Witmer Stone, in his splendid work on the plants of southern New Jersey,² remarks on the incongruity of finding a southern flora and fauna by going eastward, as may be done in the vicinity of Philadelphia. The same incongruity is exemplified by the Orthoptera which in southern New Jersey are predominantly of austral aspect, whereas those of eastern Pennsylvania are mostly of transition types.

As is well known, the region included in the present study includes

¹ Annual Report of the New Jersey State Museum, including a Report of the Insects of New Jersey, 1909, pp. 177-190.

² Annual Report of the New Jersey State Museum, including a Report of the Plants of Southern New Jersey, with Especial Reference to the Flora of the Pine Barrens, 1910.

parts of two great physiographic provinces, the Piedmont Plateau and the Coastal Plain. These correspond, as Stone has clearly shown in the work already cited, respectively to the Transition and Upper Austral biotic zones of Merriam. The dividing line between two is accordingly the "fall-line" which marks the line along which the hard rocks of the Piedmont Plateau meet the soft and incoherent deposits of the Coastal Plain.

Without a more detailed knowledge than we actually possess of the life history and of the developmental and growth requirements of Orthoptera, it is impossible at present to give a full causal explanation of the observed differences between the Orthopteran faunas of the Piedmont Plateau and Coastal Plain. Merriam regards temperature as the controlling factor, and he is probably right if by temperature he means the temperature of the medium in which the organism undergoes its development and growth, and this in a given locality might be very different in one kind of medium from what it is in a different kind, a difference which would not be shown by a record of the atmospheric temperature alone. Some of the Coastal Plain grasshoppers, which in this region are entirely absent from the Piedmont Plateau, exist in much higher latitudes, as in Massachusetts or Ontario, where the sum of the positive atmospheric temperatures for the season of growth and reproduction is much less than in our local Piedmont, but they doubtless exist there under conditions in which they receive a greater amount of heat at the critical time than they would under entirely different conditions in a region which, like our Piedmont, is warmer so far as general atmospheric temperatures are concerned.

Although temperature is probably the fundamental distributional factor, there are good reasons for questioning if it is the only factor. The environment of any organism or group of organisms is a complex of factors, each of which may act directly on the organism and influence its activities. Shelford, for example, has shown that in the case of certain species of tiger-beetles³ the distribution depends upon the simultaneous presence of a number of conditions, all of which must be fulfilled if the species is to maintain itself.

In our region the great contrast between the biotas of the Piedmont and Coastal Plain provinces is at least empirically—and doubtless in some way causally—correlated with well-marked differences in the prevailing types of soil. In the Piedmont the soils are residual,

³ Shelford, V. E., *Physiological Animal Geography*, *Jour. of Morph.*, Vol. 22, 1911, pp. 551-618.

resulting from the decomposition and disintegration of the underlying rocks. They are of a loamy texture containing relatively high proportions of clay and silt and also holding in most instances a considerable amount of available plant food. The Coastal Plain soils, with some exceptions, represent detrital materials originally transported by water and floating ice from the front of the great continental glacier. They consist almost exclusively of coarse gravels and sands which contain extremely low amounts of clay or silt and are very deficient in available plant foods.

The differences in biota are also correlated with differences in topography. The Piedmont Plateau is a region of considerable relief and consequently of good drainage, so that marshy areas constitute an insignificant feature of the region. The Coastal Plain, with the exception of a portion along its western edge, is a region of extremely low relief and poor drainage, so that marshes form a very prominent feature of the region.

FAUNAL SUBDIVISIONS.—The map accompanying Smith's report on insects in the 1909 report of the New Jersey State Museum subdivides the State into six faunal districts. This map was largely based upon the results of Stone's studies on the distribution of plants, although no acknowledgment of this fact is made in the text. In the map accompanying Stone's report on plants already cited the southern or Coastal Plain portion of the State is subdivided into five districts. Stone does not consider the region north of the fall-line in detail, but simply refers to it as the Northern District without any attempt at further subdivision. In Smith's report the same region is subdivided into three districts, *i.e.*, the Appalachian, the Highlands, and the Piedmont Plateau. All three of these subdivisions are represented in Pennsylvania.

The subdivisions of the Coastal Plain recognized by Stone are (a) the Middle District; (b) the Pine Barrens; (c) the Coastal Strip, including the coast islands and a narrow strip of mainland adjoining the salt marshes; (d) the Cape May Peninsula south of the Great Cedar Swamp, and (e) the Maritime District, embracing the salt marshes.

In the case of the Orthoptera, these same subdivisions can be readily recognized, but to my mind they are not all of equal faunistic value. As major or primary faunal centres I would class the Appalachian, Piedmont, Pine Barren, and Coastal districts, because each of these is definitely characterized by a number of species which are either entirely absent or relatively infrequent in the other districts.

The remaining subdivisions I am disposed to consider as tension zones in which there is more or less intermingling, overlapping, or interdigitation of the faunas from the surrounding primary districts. The faunistic status of the Highlands is still somewhat doubtful, owing to the lack of sufficient data, but the data at hand indicate that its only distinctive feature is the overlapping of Piedmont and Appalachian types. The Middle District does not have a single distinctive species of Orthoptera,⁴ but represents a zone in which there is an intermingling of characteristic Piedmont, Pine Barren, and Coastal types. The Cape May District has some claim to be regarded as a primary district, since two or three Orthoptera have been taken there which have not as yet been recorded elsewhere, but which future collecting may possibly prove to extend into the Middle and Coastal Districts. The Maritime District is very clearly characterized from all the other districts, but I think it preferable to regard it as an ecological subdivision of the Coastal District rather than a separate faunistic region.

I. THE APPALACHIAN DISTRICT.

The Appalachian District includes the region between the Blue Ridge and the Alleghany escarpment, thus taking in all of central and northeastern Pennsylvania and extreme northwestern New Jersey. Topographically, the greater part of the region consists, as is well known, of a succession of roughly parallel ridges and intervening valleys. In northeastern Pennsylvania these merge into a high plateau, the Pocono Plateau. The underlying rocks are all thoroughly indurated sedimentaries, which typically are characterized by steep dips and sharp folds, but in the Pocono Plateau Region are nearly horizontal or only gently folded. The soils for the most part are residual, and are essentially similar to those of the Piedmont. There is much bare rock on the higher ridges and steeper slopes. In the Pocono Region the soils are largely of glacial origin.

I have had no direct personal experience with the Orthopteran fauna of this district and consequently am dependent for information regarding its character upon the reports of other collectors. The chief sources of information are the records included in the New Jersey list and the collection of the Academy of Natural Sciences, the latter including collections of Stewardson Brown and Witmer

⁴ The one exception to this statement, *Melanoplus differentialis*, represents an introduction from the West.

Stone from Wyoming and Sullivan Counties; of Bayard Long from Monroe, Sullivan, Pike, and Wayne Counties; of Rehn from Lehigh Gap, and the official Pennsylvania State Collection, the latter including material from the vicinity of Harrisburg and central Pennsylvania. The Academy collection also includes individual specimens collected by C. W. Johnson, O. Behr, W. S. Huntington, and Dr. Joseph Leidy.

From these sources we have tangible evidence of the occurrence of the following species of Orthoptera in northeastern Pennsylvania, including under this term the counties of Lehigh, Carbon, Wyoming, Sullivan, Monroe, Wayne, and Pike.

| | |
|-----------------------------------|------------------------------------|
| <i>Orphullella speciosa</i> | <i>Spharagemon bolli</i> |
| <i>Chlæaltis conspersa</i> | <i>Trimerotropis citrina</i> |
| <i>Stenobothrus curtippennis</i> | <i>Circotettix verruculatus</i> |
| <i>Mecostethus lineatus</i> | <i>Podisma glacialis variegata</i> |
| <i>Arphia xanthoptera</i> | <i>Melanoplus fasciatus</i> |
| <i>Chortophaga viridifasciata</i> | “ <i>atlanis</i> |
| <i>Encoptolophus sordidus</i> | “ <i>minor</i> |
| <i>Camnula pellucida</i> | “ <i>femoratus</i> |
| <i>Hippiscus tuberculatus</i> | “ <i>punctulatus</i> |
| <i>Spharagemon saxatile</i> | <i>Scudderia furcata</i> |

From the more central portion of Pennsylvania we have records of the following:

| | |
|-----------------------------------|----------------------------------|
| <i>Dichromorpha viridis</i> | <i>Scudderia curvicauda</i> |
| <i>Orphullella speciosa</i> | “ <i>furcata</i> |
| <i>Arphia sulphurea</i> | <i>Amblycorypha oblongifolia</i> |
| “ <i>xanthoptera</i> | “ <i>rotundifolia</i> |
| <i>Chortophaga viridifasciata</i> | <i>Conocephalus triops</i> |
| <i>Encoptolophus sordidus</i> | “ <i>ensiger</i> |
| <i>Hippiscus tuberculatus</i> | <i>Xiphidium fasciatum</i> |
| <i>Spharagemon bolli</i> | “ <i>brevipenne</i> |
| <i>Trimerotropis citrina</i> | “ <i>nemorale</i> |
| <i>Melanoplus femur-rubrum</i> | <i>Atlantiscus dorsalis</i> |
| <i>Scudderia texensis</i> | <i>Orchelimum vulgare</i> |

The New Jersey list includes the following from the Appalachian portion of the State:

| | |
|--|--|
| <i>Dichromorpha viridis</i> ⁵ | <i>Spharagemon bolli</i> ⁵ |
| <i>Chlæaltis conspersa</i> | <i>Circotettix verruculatus</i> |
| <i>Stenobothrus curtippennis</i> ⁵ | <i>Melanoplus atlanis</i> ⁵ |
| <i>Arphia sulphurea</i> ⁵ | “ <i>femur-rubrum</i> ⁵ |
| <i>Chortophaga viridifasciata</i> ⁵ | “ <i>luridus</i> ⁵ |
| <i>Hippiscus tuberculatus</i> | “ <i>femoratus</i> |
| <i>Dissosteira carolina</i> ⁵ | <i>Orchelimum vulgare</i> |

⁵ No locality records, but species stated to occur throughout the State and doubtless occurs in the district under consideration.

The above lists are doubtless individually incomplete. On the whole, collections made in the Appalachian District are essentially Piedmont in character with the addition of some prevailing northern species which are absent or rare in the Piedmont. It is probable at least from the data at hand that the following species occur regularly throughout the entire local Appalachian District: *Orphulella speciosa*, *Chlæaltis conspersa*, *Stenobothrus curtipennis*, *Arphia sulphurea*, *A. xanthoptera*, *Chortophaga viridifasciata*, *Encoptolophus sordidus*, *Hippiscus tuberculatus*, *Dissosteira carolina*, *Spharagemon bolli*, *S. saxatile*, *Melanoplus fasciatus*, *M. atlantis*, *M. femur-rubrum*, *M. minor*, *M. femoratus*, *Scudderella curvicauda*, *S. furcata*, *Amblycorypha oblongifolia*, *A. rotundifolia*, *Conocephalus triops*, *C. ensiger*, *Orchelimum vulgare*, *Xiphidium fasciatum*, *X. brevipenne*, *X. nemorale*, and *Atlanticus dorsalis*.

The following have so far been recorded only for the more northern section of the local Appalachian District, to which it is possible that they may be restricted: *Mecostethus lineatus*, *Camnula pellucida*, *Circotettix verruculatus*, *Podisma glacialis variegata*, *Melanoplus mancus*,⁶ *M. punctulatus*, and *Scudderella pistillata*.⁶

It is rather surprising that we have no local records of *Melanoplus luridus* in the Appalachian District, this being a form which is prevailing northern in distribution and which has been recorded from the mountains of Virginia, North Carolina, and Georgia.

Another species, *Xiphidium saltans*, probably occurs in the district, but I know of no actual records of its capture.

The most distinctive Orthoptera of the Appalachian District are *Camnula pellucida*, *Spharagemon saxatile*, *Trimerotropis citrina*, *Circotettix verruculatus*, *Podisma variegata*, *Melanoplus mancus* (probably), and *Xiphidium nemorale*. These species are either confined to the district or recur only in the Highlands.

The majority of Appalachian Orthoptera are Piedmont types. These include *Orphulella speciosa*, *Dichromorpha viridis*,⁷ *Chlæaltis conspersa*, *Stenobothrus curtipennis*, *Arphia sulphurea*, *A. xanthoptera*, *Chortophaga viridifasciata*, *Encoptolophus sordidus*, *Hippiscus tuberculatus*, *Dissosteira carolina*, *Spharagemon bolli*, *Melanoplus atlantis*, *M. femur-rubrum*, *M. minor*, *M. femoratus*, *Scudderella texensis*, *S.*

⁶ Recorded from the Highlands of New Jersey, but doubtless occur in the Appalachians.

⁷ I am not sure whether this species ought to be ranked as an Appalachian species or not. It is abundant in the Piedmont and has been taken along the edge of the Appalachian, but I know of no records from typical Appalachian country.

curvicauda, *S. furcata*, *Amblycorypha oblongifolia*, *A. rotundifolia*, *Conocephalus triops*, *Orchelimum vulgare*, *Xiphidium fasciatum*, *X. brevipenne*, and *Atlanticus dorsalis*.

Some Appalachian Orthoptera are as yet unrecorded for the Piedmont Region, but recur in the Coastal Plain. Among these are *Mecostethus lineatus*, *Melanoplus fasciatus*, *M. punctulatus*, *Scudderia pistillata*, *S. septentrionalis*, and *Conocephalus ensigner*.

No extensive studies of Appalachian Orthopteran habitats have been made, so far as I am aware. *Spharagemon saxatile* is a saxicolous form and in the New Jersey list is stated to occur on rocky ridges. Doubtless its habitat in this region is like that described by Morse for New England and the Southern States. *Podisma variegata* appears from data recorded by Rehn⁸ to be constantly associated with hemlock woods, occurring, according to one observer, Mr. Behr, on the branches of the trees, but according to W. S. Huntington occasionally in grass.

II. THE HIGHLANDS.

As already mentioned, I am not inclined to regard the Highlands as of primary faunistic rank, but rather as a sort of tension area where the typical Piedmont fauna meets and intermingles with outlying representatives of the Appalachian fauna. The data from the region are unfortunately very meagre and are almost entirely restricted to the New Jersey section, the Pennsylvania Highlands being unrepresented in any of the publications or collections examined by me.

The topography of the Highlands is essentially that of the Appalachian Region, but the ridges are lower and have less precipitous slopes. The soils are of residual origin and are of the same character as the typical Piedmont soils.

The grasshopper fauna of the Highlands has never been fully described, but it will probably be found to include the following forms:

Orphulella speciosa (a)⁹
Dichromorpha viridis (b)

Chlœatis conspersa (a)
Stenobothrus curtippennis (a)

⁸ *Entom. News*, XI, 1900, p. 680.

⁹ (a) Recorded from Highland localities in New Jersey Report.

(b) Reported as occurring throughout the State in the same report.

| | |
|--|--------------------------------------|
| <i>Mecostethus lineatus</i> (c) ⁹ | <i>Melanoplus femoratus</i> (b) |
| <i>Arphia sulphurea</i> (b) | “ <i>punctulatus</i> (a) |
| “ <i>xanthoptera</i> (a) | <i>Scudderia texensis</i> (a) |
| <i>Chortophaga viridifasciata</i> (b) | “ <i>curvicauda</i> (f) |
| <i>Encoptolophus sordidus</i> (a) | “ <i>pistillata</i> (a) |
| <i>Hippiscus rugosus</i> (a, d) | “ <i>furcata</i> (a) |
| “ <i>tuberculatus</i> (a) | “ <i>septentrionalis</i> (a) |
| <i>Dissosteira carolina</i> (b) | <i>Amblycorypha oblongifolia</i> (a) |
| <i>Spharagemon bolli</i> (b) | “ <i>rotundifolia</i> (a) |
| “ <i>saxatile</i> (a) | <i>Conocephalus triops</i> (c) |
| <i>Circotettix verruculatus</i> (a) | “ <i>ensiger</i> (a) |
| <i>Pseudopomala brachyptera</i> (c) | <i>Orchelimum vulgare</i> (f) |
| <i>Schistocerca americana</i> (e) | “ <i>glaberrimum</i> (e) |
| <i>Melanoplus rancus</i> (a) | <i>Xiphidium fasciatum</i> (f) |
| “ <i>scudderi</i> (a) | “ <i>brevipenne</i> (a) |
| “ <i>atlanis</i> (b) | “ <i>nemorale</i> (c) |
| “ <i>femor-rubrum</i> (b) | “ <i>saltans</i> (f) |
| “ <i>minor</i> (a) | <i>Atlanticus dorsalis</i> (a) |
| “ <i>luridus</i> (b) | “ <i>pachymerus</i> (a) |

III. THE PIEDMONT DISTRICT.

The Piedmont Region of New Jersey consists of a rather narrow belt of gently to moderately rolling country formed almost entirely by the red shales and sandstone of Triassic age, but in Pennsylvania it widens rapidly and includes rocks of many kinds. All of these are thoroughly consolidated and, with the exception of the Triassic series, are more or less extensively metamorphosed. Topographically, the Piedmont possesses considerable relief, but is less rugged than either the Appalachian or Highland Regions, the highest elevations rarely exceeding 600 feet above sea-level. This, however, is sufficient to produce relatively swift-flowing streams and thereby to ensure good drainage. As a result, permanently moist tracts are of limited extent and are largely restricted to soggy patches about spring-heads or to seepage depressions on the level tracts bordering the streams.

The soils of the Piedmont are residual. They are highly variable in composition and texture in accordance with the varied nature of the underlying rock formations. All agree, however, in having a loamy texture, the silt-clay content never, according to the published

⁹(c) Possibly occurring throughout the Highlands, but definitely reported only from Fort Lee on the Hudson, where the Highlands meet a narrow arm from the Coastal Plain.

(d) Recorded under “*compactus*” in the New Jersey Report.

(e) From Fort Lee only, probably stragglers from the Coastal Plain.

(f) No actual records from the Highlands, but are common, widely-distributed species, which doubtless occur there.

analyses of the U. S. Bureau of Soils, falling below 35%. Most of the Piedmont soils have a sufficiently open texture to permit the ready percolation of water, but their high silt content enables them to readily conserve the supply, so that, except in periods of exceptional drought, the amount of moisture available for plant growth is considerable. Being derived either directly or indirectly from crystalline rocks, they are in most instances rich in essential plant-foods, especially potash, lime and magnesium. For these reasons the dominant type of vegetation is mesophytic and with this is correlated the presence of a prevailingly mesophilous grasshopper fauna. Originally the whole region was densely forested, the dominant tree growth consisting of hardwoods, but at the present time this has been largely removed and the country converted into farmlands and pastures.

The grasshopper fauna of the Piedmont, exclusive of tettigids and nocturnal locustids, includes, to my knowledge, the following species:

| | |
|-----------------------------------|----------------------------------|
| <i>Pseudopomala brachyptera</i> | <i>Melanoplus femur-rubrum</i> |
| <i>Eritettix carinatus</i> | “ <i>minor</i> |
| <i>Orphulella speciosa</i> | “ <i>luridus</i> |
| “ <i>pelidna</i> | “ <i>femoratus</i> |
| <i>Dichromorpha viridis</i> | <i>Scudderia texensis</i> |
| <i>Chlœaltis conspersa</i> | “ <i>curvicauda</i> |
| <i>Stenobothrus curtippennis</i> | “ <i>furcata</i> |
| <i>Arphia sulphurea</i> | <i>Amblycorypha oblongifolia</i> |
| “ <i>xanthoptera</i> | “ <i>rotundifolia</i> |
| <i>Chortophaga viridifasciata</i> | <i>Microcentrum</i> sp. |
| <i>Encoptolophus sordidus</i> | <i>Conocephalus triops</i> |
| <i>Hippiscus tuberculatus</i> | <i>Orchelimum vulgare</i> |
| “ <i>rugosus</i> | “ <i>spinulosum</i> |
| <i>Dissosteira carolina</i> | <i>Xiphidium fasciatum</i> |
| <i>Spharagemon bolli</i> | “ <i>brevipenne</i> |
| <i>Melanoplus scudderi</i> | “ <i>strictum</i> |
| “ <i>tribulus</i> | <i>Atlanticus dorsalis</i> |
| “ <i>atlantis</i> | |

Of these species those most distinctive of the Piedmont Region are *Dichromorpha viridis*, *Orphulella speciosa*, *Stenobothrus curtippennis*, *Encoptolophus sordidus*, *Hippiscus tuberculatus*, and *Melanoplus minor*. Each of these appears to be either absent, rare or local in the Coastal Plain.

The most abundant species in the Piedmont, as in the entire eastern section of the continent, is the red-legged grasshopper, *Melanoplus femur-rubrum*. This species is present far in excess of any of the other species. Next in point of numbers come such forms as *Dichro-*

morpha viridis, *Dissosteira carolina*, *Encoptolophus sordidus*, *Melanoplus femoratus*, *Chortophaga viridifasciata* and *Orchelimum vulgare*. Other common, but somewhat restricted, forms are *Stenobothrus curtipennis*, *Arphia xanthoptera*, *Arphia sulphurea*, *Orphulella speciosa*, *Melanoplus atlanis*, *Melanoplus minor*, *Melanoplus scudderi*, *Xiphidium brevipenne*, *Xiphidium fasciatum*, *Conocephalus triops*, *Orchelimum spinulosum*, *Scudderella curvicauda*, and *Scudderella furcata*.

The following are not uncommon in certain localities, but apparently are rare or lacking in many parts of the Piedmont: *Hippiscus tuberculatus*, *Hippiscus rugosus*, *Xiphidium strictum* and *Amblycorypha oblongifolia*.

The following may in general be regarded as rather scarce members of the Piedmont fauna, although in favorable spots they may be represented in considerable numbers: *Eritettix carinatus*, *Chlæaltis conspersa*, *Spharagemon bolli*, *Melanoplus luridus*, *Amblycorypha rotundifolia* and *Atlanticus dorsalis*.

Of exceptional occurrence, though in restricted locations sometimes present in surprising numbers, are *Pseudopomala brachyptera*, *Orphulella pelidna*, *Melanoplus tribulus* and *Scudderella texensis*. The first and third of these have, I believe, been taken only on the Conowingo Barrens of southeastern Pennsylvania. The other two are abundant Coastal Plain forms which only occur in small or moderate numbers in a few Piedmont localities.

The Orthopteran fauna of the Piedmont is, with some not clearly defined exceptions, monotonously uniform throughout. The only subdivisions that I have in any degree been able to recognize are habitat or ecological groups, and even these are not rigidly circumscribed, the transitions in environmental factors permitting an extensive intermingling of the forms of one habitat with those of the others.

With these limitations in mind, I think we can recognize tentatively three primary habitats or societies based upon the relative moisture content of the substratum.¹⁰ These societies are respectively

¹⁰ In treating of the various ecological subdivisions, I have in the main adopted the terminology introduced by Morse and Hancock, but have adopted a somewhat different arrangement. Both of these authors primarily subdivide the Orthoptera into ground-frequenting forms (Geophilous society of Morse, Geodytes of Hancock) and plant-frequenting types (Phytophiles of Morse, Phytodytes of Hancock). This subdivision is to me unsatisfactory because any natural habitat, no matter how dry, will show some vegetation and will accordingly contain both ground-frequenting and plant-frequenting types mingled together in hopeless confusion. To me the best practice seems to be to follow that of the plant ecologists by basing our classification of habitats or habitat-groups primarily upon the available moisture content of the substratum. As all collectors of insects know, the fauna of a marsh is strikingly different from that of a dry barren.

xerophilous, mesophilous and hygrophilous. The xerophilous society is characteristic of relatively dry situations. Morse¹¹ recognizes three subdivisions or associations of this group, *i.e.*, saxicolous or rock-frequenting, arenicolous or sand-frequenting and humicolous or those frequenting soils, loams especially, which although dry, contain a larger percentage of moisture than the sands. The last association naturally merges into the typical mesophilous society. In the Piedmont only the humicolous association appears to be represented and this is naturally not always easily separable from the dominant mesophilous society.

The xerophilous faunule is typically developed in the Piedmont upon the so-called "poor soils." These soils occur on uplands and steep hillsides where, owing to rain wash, the soil is either thin or stony and therefore capable of supporting only a coarse type of vegetation. In some cases the dryness of the ground is due to the texture of soil and underlying rock which allows a relatively rapid percolation of water, as on the ridges formed by the Chickies quartzite and Stockton conglomerates, or to the chemical character of the soil, as on the Conowingo or Serpentine Barrens. Where the woodlands have been removed the vegetation on these areas is of a somewhat open character, numerous bare patches of soil showing between the more or less scattered plants. The dominant plant growth consists of coarse herbaceous types, such as are typical of dry, waste land (bunch-grasses, *Andropogon* spp., *Panicum*, etc., cinquefoil, sheep sorrel, *Rumex acetosella*, blackberry and wild rose bushes). In such surroundings we normally encounter the following species of grasshoppers:

| | |
|-----------------------------------|-----------------------------|
| <i>Orphulella speciosa</i> | <i>Dissosteira carolina</i> |
| <i>Arphia sulphurea</i> | <i>Melanoplus atlantis</i> |
| " <i>xanthoptera</i> | " <i>femur-rubrum</i> |
| <i>Chortophaga viridifasciata</i> | " <i>minor</i> |
| <i>Encoptolophus sordidus</i> | " <i>femoratus</i> |
| <i>Hippiscus tuberculatus</i> | <i>Xiphidium strictum</i> |
| " <i>rugosus</i> | |

Other species of more sporadic occurrence, but typical xerophiles, are *Eritettix carinatus*, *Pseudopomala brachyptera*, and *Orphulella pelidna*.

Of the above species I would tentatively consider the following as the more distinctively xerophilous: *Orphulella speciosa*, *Arphia*

¹¹ Researches on North American Acridiidae, Carnegie Inst. of Washington, Publication No. 18, 1904, p. 14.

sulphurea, *Hippiscus tuberculatus*, *Hippiscus rugosus*, *Melanoplus atlantis*, *Melanoplus minor* and *Xiphidium strictum*. All of these may, as I have noticed, occur in reduced numbers in mesophilous habitats, so that they are only predominantly xerophilous, not absolutely so.

Where woodlands prevail, in which numerous small clearings occur, a somewhat different phase of the xerophilous faunule obtains. This, following Morse, we may call the sylvan phase in contradistinction from the open country or campestral phase. The tree growth in these relatively xerophytic habitats consists predominantly of oaks (*Q. alba*, *Q. rubra*, *Q. velutina*, *Q. prinus*), hickory, chestnut and dogwood, with occasional groves of scrub pine (*P. virginiana*) and red cedar (*Juniperus virginiana*). In the cleared portions of the woods, where alone grasshoppers usually occur, a mixed growth of grasses, vines and low shrubbery takes place. In such spots we usually meet with the following Orthoptera:

| | |
|-----------------------------------|----------------------------------|
| <i>Orphulella speciosa</i> | <i>Melanoplus minor</i> |
| <i>Arphia sulphurea</i> | <i>Scudderia curvicauda</i> |
| <i>Chortophaga viridifasciata</i> | " <i>furcata</i> |
| <i>Hippiscus tuberculatus</i> | <i>Amblycorypha oblongifolia</i> |
| <i>Dissosteira carolina</i> | " <i>rotundifolia</i> |
| <i>Melanoplus scudderi</i> | <i>Microcentrum</i> sp. |
| " <i>femur-rubrum</i> | <i>Atlanticus dorsalis</i> |

In addition to these, we occasionally find associated with them, sometimes in considerable numbers, the following species:

| | |
|----------------------------|---------------------------|
| <i>Eritettix carinatus</i> | <i>Melanoplus luridus</i> |
| <i>Spharagemon bolli</i> | |

Rarely one meets with the following:

| | |
|---------------------------------|----------------------------|
| <i>Pseudopomala brachyptera</i> | <i>Melanoplus tribulus</i> |
| <i>Orphulella pelidna</i> | |

This woodland or sylvan faunule is not always clearly distinguishable from the adjoining campestral faunule. There are all transitions from the one type of habitat to the other. The clearing away of the forests has extended the habitat of the campestral types. As the trees are thinned out the latter occupy the habitats originally occupied by the sylvan forms, the latter either becoming extinct or persisting locally where conditions are favorable. The more exclusively woodland species in this region are *Spharagemon bolli* and *Melanoplus luridus*, and both of these forms are, at present at least, extremely local in their distribution in the Piedmont Region, though

where conditions are favorable they are not uncommon. The other woodland types are apparently better able to adapt themselves to certain features of a campestral environment, such as the thicket and scrub formations which tend to overrun waste lands.

The mesophilous society is the dominant faunal group of the Piedmont Region, especially as represented by its campestral phase. This is the faunule which one everywhere encounters in the rich farming country, such as is typically found throughout the limestone valleys. The prevailing vegetation consists of bright green succulent grasses that form a firm sod. Roads, paths and plowed fields provide, however, abundance of bare ground suitable for geophilous types.

The campestral mesophile faunule typically yields the following species:

| | |
|-----------------------------------|--------------------------------|
| <i>Dichromorpha viridis</i> | <i>Melanoplus femur-rubrum</i> |
| <i>Chortophaga viridifasciata</i> | “ <i>femoratus</i> |
| <i>Encoptolophus sordidus</i> | <i>Conocephalus triops</i> |
| <i>Dissosteira carolina</i> | <i>Orchelimum vulgare</i> |

The sylvan phase of the mesophilous society is not always clearly distinguishable from the campestral for the reason already mentioned. It consists typically of the following:

| | |
|-----------------------------------|-----------------------------|
| <i>Chortophaga viridifasciata</i> | <i>Scudderia curvicauda</i> |
| <i>Melanoplus scudderi</i> | “ <i>furcata</i> |
| “ <i>femur-rubrum</i> | <i>Xiphidium brevipenne</i> |
| “ <i>femoratus</i> | |

As a sporadic member of this phase we may add *Scudderia texensis*.

Hygrophilous Orthoptera inhabit areas of damp, moist or wet soils. Of these we may, like Morse, distinguish two categories, namely, humicolous hydrophiles and paludicolous hydrophiles. The former are frequenters of areas in which the soil, though usually damp, is normally not wet or soggy. The latter inhabit tracts which are actually wet. In the Piedmont there is no hard-and-fast line separating these two groups. As already mentioned, hygrophilous habitats in the Piedmont Region are of extremely restricted extent, owing to the very perfect drainage of the whole region.

The campestral phase of the humicolous hygrophiles is typically represented by the fauna of the open grassy meadows which in many places border the streams. The soil of these meadows is usually a fine, alluvial clay-loam corresponding approximately to the Lickdale clay-loam of the Bureau of Soils. The vegetation is dominated by succulent grasses, which are extensively utilized for pasture. Asso-

ciated with the grasses is a large variety of other plants, among which we may mention buttercups (*Ranunculus bulbosus*), quaker-ladies (*Houstonia cærulea*), spring-beauty (*Claytonia virginica*), golden ragwort (*Senecio aureus*), cynthia (*Adopogon virginicum*), elder (*Sambucus canadensis*), iron-weed (*Vernonia noveboracensis*), blue vervain (*Verbena hastata*), joe-pye weed (*Eupatorium purpureum*, and boneset (*Eupatorium perfoliatum*).

The Orthoptera inhabiting these meadowlands and pastures include regularly the following species:

| | |
|-----------------------------------|----------------------------|
| <i>Dichromorpha viridis</i> | <i>Scudderia furcata</i> |
| <i>Chortophaga viridifasciata</i> | <i>Conocephalus triops</i> |
| <i>Melanoplus femur-rubrum</i> | <i>Orchelimum vulgare</i> |
| “ <i>femoratus</i> | <i>Xiphidium fasciatum</i> |
| <i>Scudderia curvicauda</i> | “ <i>brevipenne</i> |

Scudderia texensis is an occasional member of this faunule.

This faunule includes no peculiar types, but is chiefly distinguished from the mesophilous by the absence of the more geophilous forms) and by the proportionately much greater numbers of the hygrophilous species, such as *D. viridis*, *C. triops*, *O. vulgare* and *X. fasciatum*.

A slightly different phase of the humicolous hygrophilous society is found in open woodland occupying damp or slightly moist depressions marking usually the head-waters of some rivulet. The Orthoptera occurring in such places consist of the following species:

| | |
|------------------------------------|-----------------------------|
| <i>Chlœaltis conspersa</i> (local) | <i>Scudderia furcata</i> |
| <i>Melanoplus femur-rubrum</i> | <i>Orchelimum vulgare</i> |
| “ <i>femoratus</i> | <i>Xiphidium brevipenne</i> |
| <i>Scudderia curvicauda</i> | |

Paludicolous Orthoptera are the swamp dwellers. In the Piedmont swamps are of relatively small extent and are most commonly represented by local depressions in the meadowlands where the water-table is normally so close to the surface that the latter is kept permanently moist or even covered with water. In these swamps the vegetation consists of a mixture of succulent grasses—e.g., *Homalocenchrus oryzoides*—and sedges among which species of *Carex* are prominent, especially the tussock sedge (*C. stricta*). Such locations constitute the favorite habitat of such Orthoptera as *Stenobothrus curtippennis* and *Orchelimum spinulosum*, which appear to be the only paludicolous forms represented in the Piedmont. Owing to the small size of the swamps, Orthoptera from the adjoining drier lands frequently invade them, making it difficult to clearly discriminate this faunule from the meadow faunule.

IV. THE COASTAL PLAIN.

The Coastal Plain includes all of the country south and east of the fall-line. It consists essentially of a low plain of very slight relief and hence, for most of its extent, at least, of very imperfect drainage. This is especially true of that portion east and south of the range of low hills marking the divide between the Delaware and Atlantic drainage systems. In this part the seaward slope is exceedingly gradual and consequently the stream flow is very sluggish and the drainage very inadequate, resulting in the formation of extensive bogs. West of the divide the stream gradient is considerably greater, so that this part, constituting the Delaware Valley or Middle District of Stone, is on the whole fairly well drained, though in their lower courses the streams are so near tide-level that they become very sluggish and form wide mud-flats through which the streams tortuously meander.

The all but universal soil of the Coastal Plain is a coarse sand corresponding approximately to the Norfolk sand of the Bureau of Soils. Associated with this are frequent areas of coarse gravel similar to the Sassafras gravelly loam of the same Bureau.¹² East of the Delaware-Atlantic divide these sands and gravels form a practically unbroken cover, but west of that line, in the Middle District, they are frequently interrupted by more or less extensive areas of clays and loams, some of which are due to the exposure of the underlying Cretaceous and Miocene deposits consequent upon the removal by erosion of the original capping of sand and gravel. In consequence of this variety of soil types, the Middle District is characterized by a greater diversity of flora and fauna than the remaining subdivisions of the New Jersey Coastal Plain.

The two general features in which the Coastal Plain most markedly differs from the Piedmont Region are: (1) the almost universal presence of coarse sands, and (2) the development of extensive tracts of permanently wet areas. With these is correlated the prevalence of two widely different types of fauna, a xerophilous fauna characteristic of the sandy districts and a hygrophilous fauna characteristic of the bogs and marshes. The mesophilous fauna is of relatively limited extent, being fully represented only on the clay and loamy soils of the Middle District, but tending to spread into the other

¹² For the characteristics of these different types of Coastal Plain soils see Soil Survey of the Salem, N. J., Area, Field Operations of the Bureau of Soils, 1901.

districts with the conversion of the country into farm and truck lands.

The grasshopper fauna (exclusive of *Tettiginæ* and the more nocturnal *Locustidæ*) of the Coastal Plain includes the following species:

| | |
|-----------------------------------|---|
| <i>Tryxalis brevicornis</i> | <i>Melanoplus differentialis</i> |
| <i>Pseudopomala brachyptera</i> | “ <i>femoratus</i> |
| <i>Mermiria vigilans</i> | “ <i>punctulatus</i> |
| <i>Syrbula admirabilis</i> | <i>Paroxya floridiana</i> |
| <i>Eritettix carinatus</i> | “ <i>scudderi</i> |
| <i>Dichromorpha viridis</i> | <i>Scudderia texensis</i> |
| <i>Clinocephalus elegans</i> | “ <i>curvicauda</i> |
| <i>Orphulella speciosa</i> | “ <i>pistillata</i> |
| “ <i>pelidna</i> | “ <i>furcata</i> |
| “ <i>olivacea</i> | “ <i>septentrionalis</i> |
| <i>Chlæaltis conspersa</i> | “ <i>truncata</i> |
| <i>Stenobothrus curtippennis</i> | <i>Amblycorypha oblongifolia</i> |
| <i>Mecostethus lineatus</i> | “ <i>rotundifolia</i> |
| <i>Arphia sulphurea</i> | “ <i>uhleri</i> |
| “ <i>xanthoptera</i> | <i>Microcentrum rhombifolium</i> |
| <i>Chortophaga viridifasciata</i> | “ <i>retinerve</i> |
| <i>Encoptolophus sordidus</i> | <i>Conocephalus robustus</i> |
| <i>Hippiscus phænicopterus</i> | “ <i>triops</i> |
| “ <i>rugosus</i> | “ <i>ensiger</i> |
| <i>Dissosteira carolina</i> | “ <i>lyristes</i> |
| <i>Spharagemon bolli</i> | “ <i>exilis</i> |
| “ <i>wyomingianum</i> | “ <i>nebrascensis</i> |
| <i>Trimerotropis maritima</i> | “ <i>caudellianus</i> |
| <i>Psinidia fenestralis</i> | “ <i>palustris</i> |
| <i>Scirtetica marmorata</i> | <i>Orchelimum vulgare</i> |
| <i>Schistocerca americana</i> | “ <i>glaberrimum</i> |
| “ <i>damnifica</i> | “ <i>erythrocephalum</i> |
| “ <i>alutacea</i> | “ <i>herbaceum</i> |
| “ <i>rubiginosa</i> | “ <i>spinulosum</i> (? <i>validum</i>) |
| “ <i>sp. cf. obscura</i> | “ <i>pulchellum</i> |
| <i>Hesperotettix brevipennis</i> | “ <i>campestre</i> |
| <i>Dendrotettix quercus</i> | “ <i>minor</i> |
| <i>Melanoplus scudderi</i> | “ <i>fidicinium</i> |
| “ <i>tribulus</i> | <i>Xiphidium fasciatum</i> |
| “ <i>fasciatus</i> | “ <i>brevipenne</i> |
| “ <i>atlanis</i> | “ <i>strictum</i> |
| “ <i>femur-rubrum</i> | “ <i>saltans</i> |
| “ <i>minor</i> | “ <i>spartinæ</i> |
| “ <i>impudicus</i> | “ <i>nigropleuroides</i> |
| “ <i>luridus</i> | <i>Atlanticus dorsalis</i> |
| “ <i>stonei</i> | “ <i>pachymerus</i> |

As indicated earlier in this paper, the Coastal Plain fauna is made up of representatives of four primary regional faunules, namely, Appalachian, Piedmont, Coastal and Pine Barren.

The *Appalachian faunule* is represented by a few types that recur locally or in diminished numbers in the Coastal Plain, such as *Scud-deria pistillata*, *S. septentrionalis*, *Conocephalus ensiger* and *Xiphidium saltans*.

The *Piedmont faunule* include species whose local centre of distribution is in the Piedmont, but which occur in smaller numbers or locally in the Coastal Plain. To this group I would refer the following species:

Dichromorpha viridis

Encoptolophus sordidus

Orphulella speciosa

Melanoplus minor

Stenobothrus curtispennis

This faunule is best represented in the Middle District, to which, indeed, two of the species, *D. viridis* and *E. sordidus*, appear to be entirely confined, or at most barely enter the other districts. The other three species have been taken throughout, but only in widely separated localities and usually in very small numbers.

IV (a). THE COASTAL SUBDIVISION OR DISTRICT.

The *Coastal faunule* is typical of the marshes and low forelands bordering the ocean, the lower portions of the Delaware River and all tidal estuaries. Of this faunule we can distinguish several minor components of an ecological nature, each of which is characteristic of some well-defined physiographic feature of the region.

As is well known, the coast of New Jersey is formed by a succession of long, narrow sand-spits heaped up by wind and wave. These are the coast-islands or barrier-beaches, all of which in New Jersey are fast being transformed into summer resorts. Back of the barrier-beaches come the salt marshes, low grassy flats daily inundated by the tide. Beyond these, rising very gradually out of the marshes, comes the mainland. A narrow strip of the mainland immediately bordering the salt marshes has different faunal and floral characteristics from those of the interior—a difference first recognized by Stone, who has called it the Coastal Strip. The Coastal Strip is similar in every essential respect to the low forelands bordering the maritime marshes of the Delaware River and Bay.

In the Coastal District I recognize the following ecological groups: (1) the Subcoastal; (2) the Littoral or Dune; (3) the Submaritime, and (4) the Maritime.

The Subcoastal group is characteristic of the Coastal Strip, more especially of its drier portions. It is very rich in species, due doubtless to the diversity of conditions consequent upon the transition

from a dry, sandy upland to the low, marshy areas bordering the salt marshes. The soil throughout is a coarse sand similar to the Norfolk type. In the more elevated areas it may be quite dry at the surface, but is usually underlaid at no great depth by the water-table. The sand is very porous, but its proximity to underground water makes it a good corn and truck soil, as a result of which it has been extensively cleared and cultivated. Where the surface of the sand approaches within a foot or so of permanent water-level it is often highly impregnated with organic matter, and in such cases assumes the character of a sandy loam.

Most of the Coastal Strip is of the open campestral type, though groves and thickets of limited extent are frequent in the shallow depressions leading down to the salt marshes. Where the fields are not cultivated they soon become overrun with native and introduced weeds and bushes, among which we may mention such forms as the tall bunch-grasses of the genus *Andropogon*, timothy (*Phleum pratense*), sand-bur (*Cenchrus carolinianus*), *Juncus tenuis*, species of smart-weed (*Polygonum*), *Scleranthus annuus*, bayberry (*Myrica carolinensis*), beach plum (*Prunus maritima*), wild indigo (*Baptisia tinctoria*), sensitive pea (*Cassia nictitans* and *chamaecrista*), bush-clovers (*Lespedeza* spp.), low evening primrose (*Oenothera laciniata*), butterfly-weed (*Asclepias tuberosa*), blue toad-flax (*Linaria canadensis*), horse-mint (*Monarda punctata*), low cynthia (*Adopogon carolinianum*), rag-weed (*Ambrosia artemisiifolia*), black-eye susan (*Rubeckia hirta*), white boneset (*Eupatorium album*, etc.), golden aster (*Chrysopsis mariana*), and goldenrods (*Solidago* and *Euthamia* spp.).

This vegetation is evidently of a mild xerophytic type. The Orthoptera associated with it may therefore be regarded as a xerophilous faunule of the humicolous subtype and campestral station. To this faunule I would refer the following species:

| | |
|-----------------------------------|----------------------------------|
| <i>Syrbula admirabilis</i> | <i>Melanoplus atlanis</i> |
| <i>Eritettix carinatus</i> | " <i>femur-rubrum</i> |
| <i>Orphulella pelidna</i> | " <i>femoratus</i> |
| <i>Arphia sulphurea</i> | <i>Scudderia texensis</i> |
| " <i>xanthoptera</i> | " <i>furcata</i> |
| <i>Chortophaga viridifasciata</i> | <i>Amblycorypha oblongifolia</i> |
| <i>Hippiscus phænicopterus</i> | " <i>uhleri</i> |
| " <i>rugosus</i> | <i>Microcentrum</i> sp. |
| <i>Dissosteira carolina</i> | <i>Concephalus robustus</i> |
| <i>Trimerotropis maritima</i> | " <i>triops</i> |
| <i>Psinidia fenestralis</i> | <i>Orchelimum vulgare</i> |
| <i>Schistocerca americana</i> | <i>Xiphidium strictum</i> |
| " <i>damnifica</i> | " <i>saltans</i> |
| <i>Melanoplus scudderi</i> | |

The most abundant species is *Melanoplus femur-rubrum*, which literally swarms in the low, weedy fields and pastures just above the salt meadows, but is somewhat less frequent in the drier uplands, where it is almost equalled in numbers by such forms as *Melanoplus atlantis* and *Orphulella pelidna*. Other common species of this faunule are *Arphia xanthoptera*, *Chortophaga viridifasciata*, *Dissosteira carolina*, *Psinidia fenestralis*, *Scudderia texensis*, *Orchelimum vulgare* and *Xiphidium strictum*.

Frequent, but not especially common, species are *Syrbula admirabilis*, *Hippiscus rugosus*, *Melanoplus femoratus*, *Scudderia furcata*, both species of *Amblycorypha*, *Conocephalus robustus* and *triops*.

Frequent locally, particularly in thicketed areas and along the borders of woodlands, are such species as *Arphia sulphurea*, *Hippiscus phænicopterus*, *Schistocerca damnifica*, and *Melanoplus scudderi*. These seem to be essentially sylvan types, which in the Coastal District succeed in holding their own in the locations mentioned.

The following members of the Subcoastal faunule appear to be rare or very exceptional: *Eritettix carinatus*, *Trimerotropis maritima*, *Schistocerca americana* and *Xiphidium saltans*.

The Littoral or, more properly, Dune group is characteristic of the higher, drier parts of the beaches. As already mentioned, these beaches are formed of sand heaped up by the combined action of wind, wave and tide. In southern New Jersey, where I am most familiar with them, they all present the same physiographic features. On the ocean side there is the beach or strand, consisting of two portions, a lower beach covered regularly daily by the tide and totally devoid of all vegetation, and an upper beach, which is only covered at intervals, as during severe storms. The upper beach normally consists of dry, white quartz sand. It is largely bare, but supports an open growth of several plants, the most abundant and characteristic of which is the sea-rocket, *Cakile edentula*, other frequent associates being *Salsola kali* and *Ammodenia peploides*. Above the upper beach comes the outer or frontal dune and back of it and extending to the salt meadows stretches a variable series of minor dunes with intervening depressions, many of which are deep enough to reach to and expose the underlying marsh mud. The frontal dune is dominated by a nearly pure growth of the sand-binding grass, *Ammophila arenaria*, which also constitutes the dominant vegetation for several rods back of the frontal dune, but is gradually replaced on more leeward dune areas by a mixed growth, consisting of such forms as *Andropogon littoralis*, several species of *Panicum*,

Cenchrus tribuloides, species of *Cyperus* and *Carex*, sand-myrtle, *Hudsonia tomentosa*, and prickly-pear cactus, *Opuntia opuntia*. Further back these are replaced by the bayberry, *Myrica carolinensis*, thicket formation. This extends close to the edge of the salt marsh, but is separated from the latter by a usually narrow zone consisting chiefly of *Iva oraria* and *Baccharis halimifolia*, the distinctive salt-marsh border plants. The dune depressions harbor a hydrophytic flora similar to that characteristic of the Submaritime zone.

The chief distinguishing features of the Orthopteran fauna of the beaches are positively the abundance of *Trimerotropis maritima*, the presence of a peculiar race or possibly species of *Schistocerca* and the relative frequency of *Schistocerca americana*; negatively the absence or scarcity of several mainland species.

The following list gives all the species which to my knowledge have been taken or recorded from the beaches, excepting, however, all forms that I regard as more properly belonging to the Submaritime faunule.

| | |
|-----------------------------------|--|
| <i>Orphulella speciosa</i> | <i>Schistocerca</i> sp. cf. <i>obscura</i> |
| “ <i>pelidna</i> | <i>Melanoplus femur-rubrum</i> |
| <i>Chortophaga viridifasciata</i> | “ <i>femoratus</i> |
| <i>Hippiscus phænicopterus</i> | <i>Scudderia texensis</i> |
| <i>Dissosteira carolina</i> | “ <i>furcata</i> |
| <i>Trimerotropis maritima</i> | <i>Conocephalus robustus</i> |
| <i>Psinidia fenestralis</i> | “ <i>triops</i> |
| <i>Scirtetica marmorata</i> | <i>Orchelimum vulgare</i> |
| <i>Schistocerca americana</i> | <i>Xiphidium strictum</i> |

There is a close correspondence between the distribution of Orthoptera on the beaches and that of the vegetation already referred to. On the outermost dunes in the *Ammophila arenaria* areas *Trimerotropis maritima* abounds to the almost total exclusion of other species. Further back, where the *Ammophila* begins to be replaced by a mixed vegetation, the *Trimerotropis* gradually becomes reduced in numbers, its place being taken by such species as *Psinidia fenestralis* and *Dissosteira carolina*, both of which are abundant on bare sandy spots. The vegetation in this zone is a very open one and consequently there are numerous exposed areas of dry sand on which these forms delight to rest. Still further back from the sea we come to the bayberry thickets in which the peculiar maritime species or variety of *Schistocera* is of frequent occurrence. This form of the genus is apparently restricted to the beaches. In coloration it closely resembles *S. rubiginosa* of inland districts, but is always much larger, and, as Mr. Rehn has suggested to me, may represent a non-striped race

of *S. obscura* just as *rubiginosa* may be a similar phase of *S. alutacea*. Where the bayberry formation is more open, the grassy tracts extending about and between the bushes abound in *Melanoplus femur-rubrum* and *Orphulella pelidna*, while associated with them are much smaller, but not inconsiderable numbers of *Orchelimum vulgare*, *Scudderia texensis*, *Conocephalus robustus* and, locally at least, *Schistocerca americana*. Along the edges of the salt meadows and about the dune depressions these forms meet and more or less intermingle with the Submaritime species.

At the present time it is difficult to decide which of the species given in the above list are indigenous to the islands and which have been secondarily introduced through human agency. There can be no doubt that human occupancy by destroying primitive conditions, introducing artificial conditions and establishing railroads, turnpikes and other avenues of communication with the mainland has effected and is still effecting far-reaching changes in the faunal and floral features of the islands. The clearing away of the bayberry thickets over large tracts and the levelling of the dunes into building lots, together with the importation of gravel from the mainland, have resulted in the introduction of the common grasses and weeds of the mainland, with the result that near all thickly populated parts the vegetation is almost exclusively of the weedland type. In such places one regularly meets such Orthoptera as *Melanoplus femur-rubrum*, *Chortophaga viridifasciata*, *Dissosteira carolina*, and *Orchelimum vulgare*.

Certain species, common on the neighboring mainland, are so rare or exceptional on the beaches that there can be little doubt that they represent quite recent introductions. Among these we may mention *Hippiscus phænicopterus* (1 individual taken in a vacant lot at Sea Isle City, apparently the only instance of its occurrence on the beaches), *Melanoplus femoratus* (a few taken at Anglesea), *Conocephalus triops* (1 taken on Seven-mile Beach) and *Xiphidium strictum* (1 each from Avalon and Cape May). Two additional species apparently very rare on the beaches are *Scirtetica marmorata* and *Scudderia furcata*. It is doubtful whether these last two forms are recent introductions or relicts from a time when the islands were more extensively wooded. My own specimens of these forms from the beaches came from Seven- and Five-mile Beaches, both of which were until recently extensively wooded.

I have never seen *Orphulella speciosa* on any of the beaches, but the Academy of Natural Sciences of Philadelphia has several examples

from Anglesea, the only known instance, I believe, of the occurrence of this species in the Coastal District.

The Submaritime group characterizes the narrow zone which marks the transition from salt marsh to sandy upland. The soil of this zone is a silt darkened by organic matter. Normally it is quite damp, but, except in the more depressed areas where the ground is soggy, it forms a firm sod due to the interlacing rootlets of the thick vegetation which covers it. The Submaritime zone evidently marks the line along which the seepage of fresh water takes place from the mainland. Chemical analysis of the water from the same zone at Cold Spring Harbor, Long Island, showed it to be entirely fresh,¹³ though salt water occasionally invades the zone at the highest tides or during severe storms. The dominant vegetation consists of a mixed growth of *Spartina patens* and *Juncus gerardi* on the firmer areas and of a nearly pure growth of *Scirpus americanus* in the wet depressions. Other plants more or less frequent in this zone are *Echinochloa walteri*, *Distichlis spicata*, *Scirpus olneyi* and *robustus*, *Dondia maritima*, *Tissa marina*, *Kosteletzkya virginica*, *Ptilimnium capillaceum*, *Sabatia stellaris*, *Asclepias lanceolata*, *Gerardia purpurea* and *maritima*, *Pluchea camphorata*, *Iva oraria* and *Baccharis halimifolia*.

The Orthopteran faunule of the Submaritime zone is especially distinguished by the abundance of *Climocephalus elegans*, which frequents the *Spartina patens*-*Juncus gerardi* areas, and of *Orchelimum herbaceum*, which is partial to the patches of *Scirpus americanus*. The entire faunule includes the following species:

| | |
|---------------------------------|----------------------------------|
| <i>Tryxalis brevicornis</i> | <i>Conocephalus nebrascensis</i> |
| <i>Pseudopomala brachyptera</i> | " <i>caudellianus</i> |
| <i>Mermiria vigilans</i> | " <i>palustris</i> |
| <i>Climocephalus elegans</i> | " <i>fuscostratus</i> (?) |
| <i>Chlœaltis conspersa</i> | <i>Orchelimum herbaceum</i> |
| <i>Melanoplus femur-rubrum</i> | " <i>spinulosum</i> |
| <i>Paroxya floridiana</i> | <i>Xiphidium fasciatum</i> |
| <i>Conocephalus lyristes</i> | " <i>spartinae</i> |
| " <i>exilis</i> | |
| " <i>canorus</i> | |

Of these species the most abundant in the Submaritime zone is *Melanoplus femur-rubrum*. Next to it in point of numbers comes *Xiphidium fasciatum*. Other abundant species are *Climocephalus elegans*, *Paroxya floridiana* and *Orchelimum herbaceum*. Locally *Tryxalis brevicornis* is common in the *Scirpus* areas. The remaining

¹³ E. N. Transeau, Relation of Plant Societies to Vegetation, *Bot. Gaz.*, XLV, 1908.

species are much less frequent, though such forms as *Conocephalus lyristes* and *caudellianus* and *Orchelimum spinulosum* are not uncommon. *Pseudopomala brachyptera* and *Chlæaltis conspersa* are both very exceptional and, when found, are usually in close proximity to *Iva oraria* thickets. *Mermiria vigilans* has been taken regularly only in the vicinity of Cape May City and rarely in other localities in Cape May County, but not, so far as I am aware, outside of that county. *Conocephalus fuscostriatus* was taken once by Mr. Henry Fowler near Cape May Point. *Xiphidium spartinæ* is not infrequent in the *Spartina patens* areas, but is to be regarded as a stray from the true Maritime faunule rather than as a regular member of the present faunule.

The Maritime faunule occurs in the true salt marshes. The soil in these marshes is a soft, gelatinous muck or ooze containing a relatively high amount of salt. In spite of its softness, the greater part of the salt marsh is quite firm, owing to the thick covering of coarse grasses, the interlacing roots of which bind the soft material into a tough sod. The vegetation of the salt marsh consists of an almost pure growth of the characteristic salt marsh-grass, *Spartina strica* (= *glabra*). Of this there are two varieties easily recognizable in the New Jersey salt marshes. The more common variety is a short form that covers the flat areas away from and between the waterways; the other a much taller variety that forms reed-like growths along the tidal creeks and ditches which traverse the marshes in every direction. Wet sandy areas not occupied by the grass are frequently characterized by an open growth of salt-worts, *Salicornia europæa*, *biglovii* and *ambigua*. The only other plant that is at all conspicuous in the salt marsh is the sea-lavender, *Limonium carolinum*, which is of frequent occurrence throughout the flats covered with the short variety of *Spartina*.

The Orthoptera of the salt marsh form a very distinct faunule. In the short variety of *Spartina* occur large numbers of *Orphulella olivacea* and *Xiphidium spartinæ*, while the tall variety along the waterways is characterized by *Orchelimum fidicinium* and *Xiphidium nigropleuroides*, both of which occur there in abundance, especially the former. In addition to these, both varieties of the grass harbor moderate numbers of *Conocephalus lyristes*.

The Maritime or true salt-marsh faunule thus contains the following grasshoppers:

Orphulella olivacea
Conocephalus lyristes
Orchelimum fidicinium

Xiphidium spartinæ
 “ *nigropleusroide*

IV (b). THE PINE BARREN DISTRICT.

The *Pine Barren Faunule* is the fourth primary faunal group represented in the Coastal Plain. It is typically developed in the sandy barrens lying between the Delaware-Atlantic divide and the Coastal Strip. As already mentioned, this is a region of exceedingly slight relief, the surface sloping almost imperceptibly toward the ocean. The surface, however, is not entirely flat, but is more or less gently undulating, the hollows being occupied by the cedar bogs which form a highly characteristic physiographic feature of the district. The all but universal soil is a coarse sand similar in character to the Norfolk and Winsor sands of the Bureau of Soils. In places the sand contains many pebbles and these may become such an important constituent of the soil that it becomes a gravel similar in essential respects to the Sassafras gravelly loam. In very dry situations, where there is very little plant cover, the sand has a decidedly bleached appearance, but the subsoil is always of a deeper color, usually a pale orange or buff tint. In damper spots, where the plant covering is thicker, the sand usually has a dark gray or even black tint, due to the accumulation of organic debris.

The vegetation of the Pine Barrens is of a decidedly xerophytic aspect, owing to the coarse texture of the sand which allows the ready percolation of water. Most of the region is forested, the dominant trees on the sands and gravels being the pitch pine, *Pinus rigida*, and several oaks, especially black-jack oak, *Quercus marylandica*, scrub oak, *Q. ilicifolia*, post oak, *Q. stellata*, and scrub chestnut oak, *Q. prinoides*. Practically all of the timber at the present time is of secondary growth, the region having been cut over repeatedly and frequently swept by destructive forest fires. The woods are accordingly of a rather open character, the taller trees being much scattered, but usually with a dense undergrowth of oak and pine saplings, the former predominating. Where this undergrowth is not too thick, there are associated with these various smaller shrubs, such as bracken-fern (*Pteridium aquilinum*), sweet-fern (*Comptonia asplenifolia*), wild indigo (*Baptisia tinctoria*), mountain laurel (*Kalmia latifolia*) and blueberries (*Vaccinium vacillans* and *Gaylussacia baccata*). Where clearings have been made varying conditions prevail according to the stage of reforestation reached. In very dry, exposed situations the sand, exposed to wind action, may remain bare for a long time, giving rise to formations similar to the "blow-outs" of the Middle West. Gradually, however, a low, mat-like vegetation, composed of such forms as reindeer-moss (*Cladonia* sp.), sandwort (*Arenaria*

caroliniana), wild ipecac (*Euphorbia ipecacuanhæ*), *Hudsonia ericoides*, sand myrtle (*Dendrium buxifolium*), arbutus (*Epigæa repens*) and pyxie (*Pyxidantha barbulata*), takes possession and following or accompanying these are bunch-grasses, like the *Andropogons* and rosette grasses mostly of the genus *Panicum* (*P. commonsianum*, *addisoni*, *columbianum*, etc.). These prepare the way for a low shrub vegetation of blueberries and associated plants.

The bogs of the Pine Barrens are the results, as already mentioned, of the imperfect drainage of the region. The rain-water from the sands passes by seepage into the depressions and there accumulates until it finds an outlet into one of the general drainage systems. Owing to the low relief of the country, the water never accumulates to any great depth and is consequently choked by a luxuriant vegetation of a typical peat-bog aspect. Originally, especially in the wetter parts of the bogs, the dominant tree was the white cedar, *Chamæcyparis thyoides*, whence the term cedar-bog so frequently applied to the Pine Barren bogs. In many swamps, however, this tree has been largely removed and its place taken by a mixed growth, of which the dominant tree is the red maple, *Acer rubrum*. Along with this are large numbers of sour-gum, *Nyssa sylvatica*, and swamp magnolia, *M. virginiana*. Beneath these is usually a dense undergrowth of tall shrubs like clammy azalea, *Azalea viscosa*, sweet pepper bush, *Clethra alnifolia*, high bush-huckleberry, *Vaccinium corymbosum*, and withe-rod, *Viburnum nudum*. Where the taller vegetation is not too dense there is a lower undergrowth of cinnamon fern (*Osmunda cinnamomea*), royal fern (*Osmunda regalis*), chain fern (*Woodwardia virginica*) chokeberry (*Aronia arbutifolia*), inkberry (*Ilex glabra*) and such ericaceous shrubs as leucothoe (*L. racemosa*), privet andromeda (*Xolisma ligustrina*) and cassandra (*Chamædaphne calyculata*). In still more open places, where the shrubby growth has been cut away, a varied herbaceous growth prevails consisting predominantly of chain fern (*Woodwardia virginica*) and certain tall species of sedges and rushes (*Eleocharis* spp., *Rhynchospora alba*, *Eriophorum virginicum*, *Juncus canadensis*, *J. dichotomus*, *J. acuminatus*, *J. effusus*, etc.). Cushions of bog-moss (*Sphagnum* spp.) are frequent about the bases of these plants and in these grow several species of sundew (*Drosera*). Other plants not infrequent in these places are swamp pink (*Helonias bullata*), white fringed orchid (*Blephariglottis blephariglottis*), rose pogonia (*Pogonia ophioglossoides*), grass-pink (*Limnophyton tuberosum*) and the cranberry (*Oxycoccus macrocarpon*).

In addition to the sandy pine lands and the peat bogs, which represent the two native Pine Barren types of environment, there is a minor third type consequent upon the operations of man. Where the country is cleared and settled and the land placed under cultivation, conditions are produced which favor a fauna and flora essentially like that prevailing in the Delaware Valley and Coastal districts. In such places a weedy type of vegetation predominates, characterized by forms common in the low-lying sandy areas of those districts, among which we may mention the following: *Syntherisma sanguinalis*, *Phleum pratense*, *Chætochloa viridis*, *Cenchrus carolinianus*, *Sisymbrium officinale*, *Draba verna*, *Trifolium arvense*, *T. pratense*, *T. procumbens*, *Melilotus officinalis*, *Cassia nictitans*, *Strophostyles helvola*, *Asclepias tuberosa*, *Monarda punctata*, *Verbascum thapsus*, *Linaria canadensis*, *Plantago lanceolata*, *Specularia perfoliata*, *Ambrosia artemisiifolia*.

There are thus three types of habitat characteristic of the Pine Barrens, i.e., (1) the sand barrens; (2) the peat bogs; (3) the cultivated areas. Each of these is distinguished by certain peculiarities of flora and fauna.

The entire grasshopper fauna of the Pine Barrens (exclusive of the groups not considered in this paper) includes, to my knowledge, the following species. Some of these are referred to this fauna with a query, owing to the fact that all records of their capture are close to the borders of the Pine Barrens, a fact indicative of the possibility of their being merely stragglers from the adjoining districts.

| | |
|-----------------------------------|----------------------------------|
| <i>Mermiria vigilans</i> (?) | <i>Trimerotropis maritima</i> |
| <i>Syrbula admirabilis</i> | <i>Psinidia fenestralis</i> |
| <i>Eritettix carinatus</i> | <i>Scirtetica marmorata</i> |
| <i>Orphulella speciosa</i> (?) | <i>Schistocerca americana</i> |
| “ <i>pelidna</i> | “ <i>damnifica</i> |
| <i>Clinoccephalus elegans</i> (?) | “ <i>alutacea</i> |
| <i>Dichromorpha viridis</i> (?) | “ <i>rubiginosa</i> |
| <i>Chlæaltis conspersa</i> | <i>Hesperotettix brevipennis</i> |
| <i>Stenobothrus curtipennis</i> | <i>Dendrotettix quercus</i> |
| <i>Mecostethus lineatus</i> | <i>Melanoplus scudderi</i> |
| <i>Arphia sulphurea</i> | “ <i>fasciatus</i> |
| “ <i>xanthoptera</i> | “ <i>tribulus</i> |
| <i>Chortophaga viridifasciata</i> | “ <i>atlanis</i> |
| <i>Encoptolophus sordidus</i> (?) | “ <i>femur-rubrum</i> |
| <i>Hippiscus phænicopterus</i> | “ <i>minor</i> |
| “ <i>rugosus</i> | “ <i>impudicus</i> |
| <i>Dissosteira carolina</i> | “ <i>luridus</i> |
| <i>Spharagemon bolli</i> | “ <i>stonei</i> |
| “ <i>wyomingianum</i> | “ <i>femoratus</i> |

| | |
|----------------------------------|--------------------------------------|
| <i>Melanoplus punctulatus</i> | <i>Conocephalus caudellianus</i> (?) |
| <i>Paroxya floridiana</i> | <i>Microcentrum</i> sp. |
| “ <i>scudder</i> i | <i>Orchelimum vulgare</i> |
| <i>Scudderia texensis</i> | “ <i>glaberrimum</i> |
| “ <i>curvicauda</i> | “ <i>erythrocephalum</i> |
| “ <i>furcata</i> | “ <i>spinulosum</i> |
| “ <i>septentrionalis</i> | “ <i>pulchellum</i> |
| “ <i>truncata</i> | “ <i>minor</i> |
| <i>Amblycorypha oblongifolia</i> | <i>Xiphidium fasciatum</i> |
| “ <i>rotundifolia</i> | “ <i>brevipenne</i> |
| “ <i>uhleri</i> | “ <i>strictum</i> |
| <i>Conocephalus robustus</i> | “ <i>saltans</i> |
| “ <i>triops</i> | <i>Atlanticus dorsalis</i> |
| “ <i>exilis</i> canorus (?) | “ <i>pachymerus</i> |
| “ <i>lyristes</i> (?) | |

The most distinctive Pine Barren species, *i.e.*, those not taken outside of the Pine Barrens, are *Hesperotettix brevipennis*,¹⁴ *Dendrotettix quercus*, *Melanoplus impudicus*, *Melanoplus stonei*, *Paroxya scudder*i, *Scudderia truncata* and *Orchelimum erythrocephalum*.

The following are essentially Pine Barren species, that is, have their centre of distribution in the Pine Barrens, but may occur in reduced numbers or in exceptional locations in one or more of the adjoining districts:

| | |
|--------------------------------|-----------------------------------|
| <i>Hippiscus phænicopterus</i> | <i>Melanoplus fasciatus</i> |
| <i>Spharagemon bolli</i> | “ <i>tribulus</i> |
| “ <i>wyomingianum</i> | “ <i>luridus</i> |
| <i>Scirtetica marmorata</i> | “ <i>punctulatus</i> |
| <i>Schistocerca damnifica</i> | <i>Orchelimum glaberrimum</i> (?) |
| “ <i>alutacea</i> | “ <i>pulchellum</i> |
| “ <i>rubiginosa</i> | “ <i>minor</i> |

In the following list I give those species which appear to be of common occurrence throughout the entire Pine Barrens:

| | |
|-----------------------------------|-----------------------------------|
| <i>Orphulella pelidna</i> | <i>Schistocerca rubiginosa</i> |
| <i>Arphia sulphurea</i> | <i>Melanoplus scudder</i> i |
| “ <i>xanthoptera</i> | “ <i>fasciatus</i> |
| <i>Chortophaga viridifasciata</i> | “ <i>atlanis</i> |
| <i>Hippiscus phænicopterus</i> | “ <i>luridus</i> |
| <i>Dissosteira carolina</i> | “ <i>femoratus</i> |
| <i>Spharagemon bolli</i> | <i>Paroxya scudder</i> i |
| “ <i>wyomingianum</i> | <i>Scudderia curvicauda</i> |
| <i>Psinidia fenestralis</i> | “ <i>furcata</i> |
| <i>Scirtetica marmorata</i> | <i>Amblycorypha oblongifolia</i> |
| <i>Schistocerca damnifica</i> | <i>Microcentrum</i> sp. |
| “ <i>alutacea</i> | <i>Orchelimum erythrocephalum</i> |

¹⁴ Taken once, however, at “Anglesea,” Cape May County, by John B. Smith.

Other species regularly found in the Pine Barrens, but either scarce throughout or of only local frequency, include the following:

| | |
|-------------------------------------|----------------------------------|
| <i>Syrbula admirabilis</i> | <i>Amblycorypha rotundifolia</i> |
| <i>Eritettix carinatus</i> | “ <i>uhleri</i> |
| <i>Chlœaltis conspersa</i> | <i>Conocephalus robustus</i> |
| <i>Hippiscus rugosus</i> (?) | <i>Orchelimum glaberrimum</i> |
| <i>Hesperotettix brevipennis</i> | “ <i>spinulosum</i> |
| <i>Dendrotettix quercus</i> | “ <i>pulchellum</i> |
| <i>Melanoplus tribulus</i> | “ <i>minor</i> |
| “ <i>femur-rubrum</i> ¹⁵ | <i>Xiphidium brevipenne</i> |
| “ <i>impudicus</i> | “ <i>strictum</i> |
| “ <i>stonei</i> | “ <i>saltans</i> |
| “ <i>punctulatus</i> | <i>Atlanticus dorsalis</i> |
| <i>Scudderia texensis</i> | “ <i>pachymerus</i> |

The species in the following list appear from available records to be of only very infrequent or exceptional occurrence in the Pine Barrens, and are evidently stragglers or invaders from the Delaware Valley, Coastal or Cape May Districts. Certain of these forms, however, may occur in fair numbers in places much modified by human agency.

| | |
|----------------------------------|-------------------------------|
| <i>Mermiria vigilans</i> | <i>Schistocerca americana</i> |
| <i>Orphulella speciosa</i> | <i>Melanoplus minor</i> |
| <i>Clinocephalus elegans</i> | <i>Paroxya floridiana</i> |
| <i>Dichromorpha viridis</i> | <i>Conocephalus triops</i> |
| <i>Stenobothrus curtippennis</i> | “ <i>exiliscanorus</i> |
| <i>Mecostethus lineatus</i> | “ <i>lyristes</i> |
| <i>Encoptolophus sordidus</i> | “ <i>caudellianus</i> |
| <i>Trimerotropis maritima</i> | <i>Xiphidium fasciatum</i> |

As previously mentioned, we distinguish three types of Pine Barren habitats, each of which is characterized by certain well-defined peculiarities of moisture, substratum and flora. Correlated with these we have equally well-marked differences in the Orthopteran faunule of each habitat.

The Orthopteran faunule of the Sand Barrens is a markedly xerophilous one, this being especially true of those forms that inhabit bare, open stretches of clear, white sand. In such places the dominant species are the geophilous arenicoles, *Scirtetica marmorata* and *Psinidia fenestralis*, while associated with them are usually smaller, but considerable, numbers of *Spharagemon wyomingianum* and very rarely a few examples of *Trimerotropis maritima*. Where the sand

¹⁵ Abundant locally in farming and residential districts, but scarce in typical Pine Barrens.

has become covered with a low open blueberry scrub, numerous additional species are of frequent occurrence, such as *Melanoplus luridus*, *Spharagemon bolli*, *Orphulella pelidna*, *Hippiscus phænicopterus*, *Dissosteira carolina*, *Melanoplus fasciatus*, and *M. impudicus*. In higher and denser scrub, such as is formed by a mixture of blueberry bushes and oak saplings, the more strictly arenicolous types become infrequent, while sylvan types become dominant. Among these we may mention as especially frequent the following: *Melanoplus luridus*, *Spharagemon bolli*, *Schistocerca rubiginosa*, *Melanoplus impudicus*, *Melanoplus scudderi*, *Melanoplus fasciatus*, *Scudderia curvicauda* and *Scudderia furcata*. The typical Sand Barrens faunule, taken as a whole, consists of the following species:

| | |
|----------------------------------|----------------------------------|
| <i>Orphulella pelidna</i> | <i>Melanoplus scudderi</i> |
| <i>Arphia sulphurea</i> | " <i>fasciatus</i> |
| <i>Hippiscus phænicopterus</i> | " <i>tribulus</i> |
| <i>Dissosteira carolina</i> | " <i>impudicus</i> |
| <i>Spharagemon bolli</i> | " <i>luridus</i> |
| " <i>wyomingianum</i> | " <i>femoratus</i> |
| <i>Psinidia fenestralis</i> | <i>Scudderia curvicauda</i> |
| <i>Scirtetica marmorata</i> | " <i>furcata</i> |
| <i>Schistocerca damnifica</i> | <i>Amblycorypha oblongifolia</i> |
| " <i>rubiginosa</i> | " <i>rotundifolia</i> |
| <i>Hesperotettix brevipennis</i> | <i>Microcentrum</i> sp. |

Belonging to this faunule, but usually rare and local in distribution, are the following:

| | |
|-------------------------------|-----------------------------|
| <i>Eritettix carinatus</i> | <i>Melanoplus stonei</i> |
| <i>Trimerotropis maritima</i> | " <i>punctulatus</i> |
| <i>Dendrotettix quercus</i> | <i>Orchelimum minor</i> |
| <i>Melanoplus minor</i> | <i>Xiphidium brevipenne</i> |

In the more extensive clearings, such, for example, as the fire-breaks along the railroads, where the scrub growth is short and quite open with considerable grassy areas intermixed, a campestral-like modification of the Sand Barren faunule takes place, characterized by the presence of large numbers of species typical of the Coastal District. The more abundant of these apparently secondary species are *Melanoplus atlanis*, *Arphia xanthoptera*, *Chortophaga viridifasciata* and *Melanoplus femoratus*. With these are the usual typical Pine Barren species.

The Peat Bog faunule of the Pine Barrens is usually typified by the following species of Orthoptera: *Schistocerca alutacea*, *Paroxya scudderi*, *Orchelimum glaberrimum*, *erythrocephalum* and *pulchellum*. As rare or occasional constituents we may mention *Chlœaltis conspersa*,

Stenobothrus curtippennis, *Mecostethus lineatus*, *Clinocephalus elegans*, *Paroxya floridiana*, *Orchelimum vulgare*, *O. spinulosum* and *Xiphidium fasciatum*. *Mermiria vigilans* I took once in a rather open bog at Belle Plain along the southern edge of the Pine Barrens. All of these species are most frequent in the more open, well-lighted parts of the bogs. In the densely wooded parts they are absent or exceedingly scarce.

In cleared and cultivated districts a type of faunule occurs which in essential respects resembles the Subcoastal faunule of the Coastal District. This faunule is characterized by the dominance of *Melanoplus femur-rubrum*, a grasshopper that is remarkably exceptional in the less disturbed portions of the Pine Barrens, as Rehn has pointed out. Common associates of this species in the settled parts of the Barrens are *Dissosteira carolina*, *Orphulella pelidna*, *Melanoplus atlantis*, *Arphia xanthoptera*, *Chortophaga viridifasciata* and *Melanoplus femoratus*. Much less frequent and, on the whole, rather local forms appear to be such species as *Conocephalus robustus*, *C. triops*, *Orchelimum vulgare*, *Xiphidium strictum*, *Amblycorypha uhleri* and *Hippiscus rugosus*. This faunule is most typically represented in old and neglected fields well overrun with weedy vegetation.

IV (c). THE MIDDLE DISTRICT OR DELAWARE VALLEY.

As already mentioned, I am not disposed to consider the Middle District of the Coastal Plain as having the same faunal value as the Coastal and Pine Barren Districts. It contains no distinctive species of Orthoptera, its claim to recognition as a separate Orthopteran faunal province being based solely upon the intermingling of faunules which in the other districts rarely or never intermingle and the absence of certain of the more distinctive Pine Barren types.

The Middle District includes all that part of New Jersey which lies south of the fall-line and west and north of the Delaware-Atlantic Divide, together with the more hilly districts of northern Coastal Plain New Jersey and a narrow strip of relatively low land in Pennsylvania bordering the Delaware River south of Trenton. As Stone has shown, this part of Pennsylvania has many distinctive Coastal Plain plants. A similar agreement is to be seen in the Orthoptera, especially in those inhabiting the marshes.

This strip of Coastal Plain country in Pennsylvania has so many characteristics differentiating it from the more typical Coastal Plain as exemplified in New Jersey that it requires separate consideration. It represents a series of successive flood-plains of the Delaware River,

each of which is separated from the next succeeding one by a low escarpment or terrace. The youngest of these is practically on a level with the river and forms a strip of marshland varying in width from a fraction of a mile to three or four miles. The most typical representative of this level is the well-known Tinicum Marshes immediately south of Philadelphia. In physiographic and floristic features these marshes bear a close resemblance to the undrained, open bottomlands of the Central States. Except where ditched and diked, these marshes are permanently covered with water backed up by the tide. They support a luxuriant growth of hydrophytic grasses and sedges. The soil is a rich, dark muck, the dark color being due to the decay of the marsh vegetation.

Back of these river marshes is a terrace, about forty feet in height, which marks the border of a level tract corresponding to an earlier stage of deposition (Cape May Stage). A still earlier stage is represented by a second terrace a mile or two further away from the river (Pensauken Stage). This extends back to the escarpment that marks the position of the fall-line. The deposits forming these terraces are alluvial in origin and consist of light-colored gravels and clay loams essentially similar in appearance and texture to the typical Piedmont soils. The soil is quite fertile and is extensively cultivated, so that the region consists mostly of open fields and pastures.

The Orthoptera of these upland terraces are, with two exceptions, common Piedmont types, so that from the standpoint of their grasshopper fauna these terraces are a part of the Piedmont. The two exceptions are *Orphulella pelidna* and *Melanoplus differentialis*, the former of which I have found to be locally quite frequent along the edge of the lower terrace, as at Bartram's Gardens, but it is not quite as common or as evenly distributed as its congener, *O. speciosa*, which is a typical Piedmont species. *Melanoplus differentialis* is in a class by itself. It appears to have been introduced from the West. It is now abundant in the low lands bordering the Delaware River and frequently migrates from them to the neighboring uplands.

One Piedmont species has never, so far as I am aware, been recorded from these terraces. I refer to *Hippiscus tuberculatus*.

In the following list I give the species of grasshoppers, which, so far as known, occur on these terrace lands:

Dichromorpha viridis
Orphulella speciosa
" *pelidna*

Arphia sulphurea
" *xanthoptera*
Chortophaga viridifasciata

| | |
|-------------------------------|-----------------------------|
| <i>Encoptolophus sordidus</i> | <i>Melanoplus femoratus</i> |
| <i>Dissosteira carolina</i> | <i>Conocephalus triops</i> |
| <i>Melanoplus atlanis</i> | <i>Orchelimum vulgare</i> |
| “ <i>femur-rubrum</i> | <i>Xiphidium fasciatum</i> |
| “ <i>minor</i> | “ <i>brevipenne</i> |
| “ <i>differentialis</i> | |

This list is doubtless incomplete. Further examination of the country would probably show the presence of other typical or common Piedmont forms not here listed.

The river marshes are characterized by a fauna which in many respects approximates that typical of the wet lands of the Coastal Plain, but which retains a strong Piedmont cast. In southeastern Pennsylvania these marshes have yielded a rich Orthopteran fauna consisting of the following species:

| | |
|--|--|
| <i>Dichromorpha viridis</i> | <i>Paroxya floridiana</i> |
| <i>Orphulella speciosa</i> | <i>Scudderia texensis</i> |
| “ <i>pelidna</i> | “ <i>curvicauda</i> |
| <i>Stenobothrus curtippennis</i> | <i>Amblycorypha rotundifolia</i> ¹⁶ |
| <i>Mecostethus lineatus</i> | <i>Conocephalus robustus</i> |
| <i>Arphia xanthoptera</i> | “ <i>triops</i> |
| <i>Chortophaga viridifasciata</i> | “ <i>nebrascensis</i> |
| <i>Encoptolophus sordidus</i> | “ <i>palustris</i> |
| <i>Dissosteira carolina</i> | <i>Orchelimum vulgare</i> |
| <i>Schistocerca alutacea</i> ¹⁶ | “ <i>spinulosum</i> |
| <i>Melanoplus atlanis</i> | <i>Xiphidium fasciatum</i> |
| “ <i>femur-rubrum</i> | “ <i>saltans</i> ¹⁶ |
| “ <i>minor</i> | “ <i>brevipenne</i> |
| “ <i>differentialis</i> | “ <i>strictum</i> |
| “ <i>femoratus</i> | |

In this list two minor groups are represented, i.e., that characteristic of dry ground, such as occurs on the low elevations which occur here and there on the marshes, and that of the marshes proper. The former includes such species as *Orphulella speciosa*, *O. pelidna*, *Arphia xanthoptera*, *Chortophaga viridifasciata*, *Encoptolophus sordidus*, *Dissosteira carolina*, *Melanoplus atlanis*, *M. minor*, *Conocephalus robustus*, and *Xiphidium strictum*. The second group includes *Stenobothrus curtippennis*, *Mecostethus lineatus*, *Paroxya floridiana*, *Conocephalus nebrascensis*, *C. palustris* and *Orchelimum spinulosum*. The remaining species occur indifferently in both kinds of habitat, though certain of them may exhibit a stronger preference for one of the habitats as compared with the other.

¹⁶ Apparently very unusual, but represented by specimens in the collection of the Academy of Natural Sciences.

The Coastal Plain affinities of these lowlands is shown in the presence of such Orthoptera as *Paroxya floridiana*, *Conocephalus robustus*, *C. nebrascensis* and *C. palustris*, and in the comparative abundance of such forms as *Orphulella pelidna* and *Scudderia texensis*. On the other hand, the influence of the Piedmont is evidenced by the abundance of species like *Dichromorpha viridis*, *Orphulella speciosa*, *Stenobothrus curtispennis* and *Encoptolophus sordidus*.

In this narrow strip of Coastal Plain country the most abundant grasshopper is *Melanoplus femur-rubrum*. It far outnumbers all the other species and is especially abundant in the low humid tracts adjoining the river marshes. Less common, but quite frequent species are *Dichromorpha viridis*, *Stenobothrus curtispennis*, *Dissosteira carolina*, *Chortophaga viridifasciata*, *Encoptolophus sordidus*, *Orphulella speciosa*, *Orchelimum vulgare*, *Melanoplus differentialis*, *M. femoratus*, *Xiphidium fasciatum*, *Orchelimum spinulosum*, *Xiphidium strictum*, *X. brevipenne* and *Arphia xanthoptera*. Other forms of not uncommon occurrence are *Orphulella pelidna*, which in spots may be a close rival of its congener, *O. speciosa*, *Conocephalus robustus*, *C. triops*, and *Scudderia texensis*. The remaining species are more or less infrequent or local in distribution.

Further south at Newcastle, Delaware, the Coastal Plain component of the fauna becomes more prominent, due to the influx of the more strictly Coastal types, such as *Tryxalis brevicornis*, *Syrbula admirabilis* and *Orchelimum herbaceum*. My study at this locality was very superficial, but during a few hours' collecting there I noted the following species:

| | |
|--------------------------------|----------------------------------|
| <i>Tryxalis brevicornis</i> | <i>Melanoplus differentialis</i> |
| <i>Syrbula admirabilis</i> | “ <i>femoratus</i> |
| <i>Dichromorpha viridis</i> | <i>Paroxya floridiana</i> |
| <i>Orphulella speciosa</i> | <i>Scudderia texensis</i> |
| “ <i>pelidna</i> | <i>Conocephalus triops</i> |
| <i>Arphia xanthoptera</i> | <i>Orchelimum herbaceum</i> |
| <i>Dissosteira carolina</i> | <i>Xiphidium fasciatum</i> |
| <i>Melanoplus femur-rubrum</i> | |

East of the Delaware River in New Jersey the Middle District forms a zone varying between 10 and 25 miles in width. The underlying geological formations are unconsolidated sediments of sand, clay and glauconitic marls with occasional shell beds belonging to the Cretaceous and Miocene Ages, but, except where they have been exposed by stream erosion, these are everywhere covered by a sheet of Pleistocene sand and gravel. Close to the Delaware-Atlantic

divide the land possesses a moderate amount of relief; here the streams have cut ravines of from 50 to 100 feet in depth. Near the Delaware, however, the surface is an almost level plain with the streams meandering sluggishly through wide tidal mud-flats. In their upper courses there is sufficient fall to enable the streams to effect fairly adequate drainage, so that extensive inland bogs comparable to those at the heads of the Pine Barren streams, are exceptional. In their lower reaches the streams are so near tide level that drainage is extremely imperfect and, as a result, the low flats bordering the streams are kept in a state of perpetual saturation.

The soils of the Middle District are much more varied than are those of the other subdivisions of the Coastal Plain. The most frequent is the Norfolk sand which occurs at practically all levels. As a rule, it is thinner than in the Pine Barrens and the resultant proximity to the water-table probably accounts for the somewhat less xerophytic aspect of the vegetation which in West Jersey grows on this type of soil. At higher elevations, where Norfolk sand is naturally drier, it is not readily cultivable and is accordingly mostly forested, the dominant tree growth consisting of pines (*Pinus virginiana* and *rigida*), oaks (*Quercus alba*, *stellata*, *prinus*, *marylandica* and *ilicifolia*) and hickories (*Hicoria alba* and *glabra*). At lower levels, as in the immediate vicinity of the Delaware River, where the surface of the sand approaches close to tide level, conditions obtain similar to those of the Coastal Strip. The sand here is quite productive, and consequently most of the country is cleared and used for farming purposes.

Locally there are extensive tracts of loamy soils developed in West Jersey which in many respects closely approach the Piedmont soils. The more important of these are the Collington sandy loam and the Sassafras loam. The former is derived from the green sand or glauconitic marls of the Cretaceous series. This material is highly retentive of moisture and is also extremely rich in available plant-foods. The Collington sandy loam is largely confined to the vicinity of the streams along which the greensand layers have been exposed by erosion. Owing to its richness, nearly all areas of this soil are under cultivation; the forests persisting only on the steeper slopes along the streams. The vegetation is decidedly mesophytic in aspect, the usual tree growth consisting of white, black and red oaks, hickories, chestnut, beech, tulip-trees, red cedar, sweet gum, red maple and dogwood.

The Sassafras loam is typically represented in the vicinity of

Bridgeton. As analyzed by the Bureau of Soils, it is remarkable for its low sand content (9-25%) and high percentage of silt (55-75%) and clay (10-15%). It is a highly fertile soil and is almost entirely under cultivation.

The grasshopper fauna of the New Jersey portion of the Middle District includes the following species:

| | |
|---|--|
| <i>Tryxalis brevicornis</i> | <i>Melanoplus luridus</i> |
| <i>Pseudopomala brachyptera</i> | " <i>differentialis</i> |
| <i>Syrbula admirabilis</i> | " <i>femoratus</i> |
| <i>Eritettix carinatus</i> ¹⁷ | <i>Paroxya floridiana</i> |
| <i>Dichromorpha viridis</i> | <i>Scudderia texensis</i> |
| <i>Clinocephalus elegans</i> | " <i>curvicauda</i> |
| <i>Orphulella speciosa</i> | " <i>pistillata</i> |
| " <i>pelidna</i> | " <i>furcata</i> |
| " <i>olivacea</i> ¹⁷ | <i>Amblycorypha oblongifolia</i> |
| <i>Chlæaltis conspersa</i> | " <i>rotundifolia</i> |
| <i>Stenobothrus curtippennis</i> | " <i>uhleri</i> |
| <i>Mecostethus lineatus</i> | <i>Microcentrum</i> spp. |
| <i>Arphia sulphurea</i> | <i>Conocephalus robustus</i> |
| " <i>xanthoptera</i> | " <i>triops</i> |
| <i>Chortophaga viridifasciata</i> | " <i>ensiger</i> |
| <i>Encoptolophus sordidus</i> | " <i>nebrascensis</i> |
| <i>Hippiscus phænicopterus</i> | " <i>lyristes</i> ¹⁷ |
| " <i>rugosus</i> | " <i>palustris</i> ¹⁷ |
| <i>Dissosteira carolina</i> | <i>Orchelimum vulgare</i> |
| <i>Spharagemon bolli</i> | " <i>herbaceum</i> |
| " <i>wyomingianum</i> | " <i>spinulosum</i> |
| <i>Trimerotropis maritima</i> | " <i>pulchellum</i> |
| <i>Psinidia fenestralis</i> | " <i>minor</i> |
| <i>Scirtetica marmorata</i> | " <i>fidicinium</i> ¹⁷ |
| <i>Schistocerca americana</i> ¹⁷ | <i>Xiphidium fasciatum</i> |
| " <i>damnifica</i> | " <i>brevipenne</i> |
| " <i>alutacea</i> | " <i>strictum</i> |
| " <i>rubiginosa</i> | " <i>saltans</i> |
| <i>Melanoplus scudderi</i> | " <i>spartinæ</i> |
| " <i>atlanis</i> | " <i>nigropleuroides</i> ¹⁷ |
| " <i>femur-rubrum</i> | <i>Atlanticus dorsalis</i> |
| " <i>minor</i> | |

The dominant and more uniformly distributed types in the Middle District are the species belonging to the Coastal fauna, but in the northern half these are associated with a considerable number of typical Piedmont species, such as *Dichromorpha viridis*, *Stenobothrus curtippennis* and *Encoptolophus sordidus*. All three of these are com-

¹⁷ Not, so far as I am aware, actually recorded from the Middle District, but occurrence highly probable.

mon in the upper portions of the district, though, on the whole, considerably less frequent than in the Piedmont Region. *Orphulella speciosa* has been taken in the Middle District, but appears to be exceedingly scarce, in marked contrast to its abundance on the west shores of the Delaware. During four seasons' collecting I took only two specimens. The Piedmont component of the fauna gradually thins out as one goes southward. *Encoptolophus sordidus* I have not taken south of Laurel Springs, Camden County, while the southern limits of *Dichromorpha viridis* are, according to my observations, in the vicinity of Bridgeton, Cumberland County. *Stenobothrus curtipennis* extends into the Cape May Peninsula, but is there of very local occurrence.

The most abundant grasshopper is *Melanoplus femur-rubrum*. Other forms which appear to be of common occurrence are *Orphulella pelidna*, *Melanoplus atlanis*, *Dissosteira carolina*, *Chortophaga viridifasciata*, *Arphia xanthoptera*, *Orchelimum vulgare*, *Melanoplus femoratus*, *Psinidia fenestralis*, *Xiphidium fasciatum*, *Xiphidium strictum*, *Paroxya floridiana*, *Melanoplus differentialis* (locally on the Delaware below Gloucester), *Encoptolophus sordidus* (in the northern half only), *Xiphidium brevipenne*, and *Arphia sulphurea*. Somewhat less frequent, but of not uncommon occurrence, are *Syrbula admirabilis*, *Melanoplus scudderi*, *Scudderia texensis*, *curvicauda* and *furcata*, *Conocephalus robustus*, *C. triops*, *Spharagemon bolli*, *Hippiscus rugosus*, *Dichromorpha viridis* (northern section only) and *Stenobothrus curtipennis* (frequent, but somewhat local, in northern section, exceptional in southern section). The remaining species are either rare or, if frequent, only under exceptional circumstances.

Locally, where there are considerable areas of nearly pure sand of moderately high elevation, conditions prevail closely resembling those of the Pine Barrens. An isolated patch of this kind occurs just west of Jericho, Cumberland County (shown in pink on the map accompanying the State report on insects). In such places the Orthoptera have a strong Pine Barren aspect. The prevailing species are *Scirtetica marmorata*, *Melanoplus luridus*, *Psinidia fenestralis*, *Spharagemon bolli*, *Spharagemon wyomingiana*, *Orphulella pelidna*, *Arphia sulphurea*, *Hippiscus phænicopterus* and *Schistocerca rubiginosa*. With these are other species, such as *Dissosteira carolina*, *Melanoplus atlanis*, *Arphia xanthoptera*, *Chortophaga viridifasciata*, *Schistocerca damnifica*, *Melanoplus scudderi*, *M. femoratus*, *M. femur-rubrum* (a minor constituent of this association), *Syrbula admirabilis*, *Scudderia curvicauda* and *furcata* and *Xiphidium brevipenne*.

On those areas where the dominant soil is a loam, as in the "marl-belt" and the Sassafras loam district, the Orthoptera have a pronounced mesophilous aspect, the fauna closely resembling that of the Piedmont Region. This faunule is dominated by *Melanoplus femur-rubrum*, with which are usually associated *Dissosteira carolina*, *Melanoplus femoratus*, *Arphia xanthoptera*, *Orphulella pelidna*, *Dichromorpha viridis*, *Chortophaga viridifasciata*, *Encoptolophus sordidus* and *Orchelimum vulgare*.

IV (d). THE CAPE MAY DISTRICT.

This, according to Stone, includes the Cape May Peninsula south of the Great Cedar Swamp. Floristically, the district is characterized by the presence of a considerable number of Lower Austral types which do not extend north of the district. In the Orthopteran fauna this distinction is not so pronounced, the only species which are peculiar to the region or extend but a short distance beyond it being *Mermiria vigilans* and *Conocephalus fuscostriatus*. Negatively, the district is characterized by the absence or relative scarcity of certain Middle District and Pine Barren species. Of Middle District species the following are as yet unknown from the Cape May Peninsula: *Dichromorpha viridis*, *Encoptolophus sordidus*, *Melanoplus differentialis* and *Atlanticus dorsalis*; *Orphulella speciosa* and *Stenobothrus curtippennis* occur, but are local and usually quite rare.

Of typical Pine Barren species there appear to be no records of the existence of the following species in the Cape May Peninsula, though some of them may occur as far south as the southern edge of the Great Cedar Swamp, as at Sea Isle Junction, where I have taken several species which I have not been able to find elsewhere in the Peninsula:

| | |
|----------------------------------|---|
| <i>Spharagemon wyomingianum</i> | <i>Melanoplus punctulatus</i> |
| <i>Dendrotettix quercus</i> | <i>Paroxya scudderi</i> ¹⁸ |
| <i>Melanoplus impudicus</i> | <i>Orchelimum erythrocephalum</i> ¹⁸ |
| " <i>tribulus</i> ¹⁸ | " <i>pulchellum</i> ¹⁸ |
| " <i>fasciatus</i> ¹⁸ | " <i>minor</i> ¹⁸ |
| " <i>stonei</i> | <i>Atlanticus dorsalis</i> |

I have never been able to find *Hesperotettix brevipennis* south of the Great Cedar Swamp, but there is a single female in the Academy collection taken by John B. Smith at "Anglesea."

The following list includes all the species of Acrididæ (exclusive

¹⁸ Taken at Sea Isle Junction.

of Tettiginæ) and Locustidæ (exclusive of Gryllacrinæ and Stenopelmatinæ) known to me to occur in the district:

| | |
|-----------------------------------|----------------------------------|
| <i>Tryxalis brevicornis</i> | <i>Melanoplus minor</i> |
| <i>Pseudopomala brachyptera</i> | " <i>luridus</i> |
| <i>Mermiria vigilans</i> | " <i>brevipenne</i> |
| <i>Syrbula admirabilis</i> | " <i>strictum</i> |
| <i>Eritettix carinatus</i> | " <i>saltans</i> |
| <i>Clinocephalus elegans</i> | " <i>spartinæ</i> |
| <i>Orphulella speciosa</i> | " <i>nigropleuroides</i> |
| " <i>pelidna</i> | " <i>femoratus</i> |
| " <i>olivacea</i> | <i>Paroxya floridiana</i> |
| <i>Clæaltis conspersa</i> | <i>Scudderia texensis</i> |
| <i>Stenobothrus curtippennis</i> | " <i>curvicauda</i> |
| <i>Mecostethus lineatus</i> | " <i>furcata</i> |
| <i>Arphia sulphurea</i> | <i>Amblycorypha oblongifolia</i> |
| " <i>xanthoptera</i> | " <i>rotundifolia</i> |
| <i>Chortophaga viridifasciata</i> | " <i>uhleri</i> |
| <i>Hippiscus phænicopterus</i> | <i>Microcentrum</i> sp. |
| " <i>rugosus</i> | <i>Conocephalus robustus</i> |
| <i>Dissosteira carolina</i> | " <i>triops</i> |
| <i>Spharagemon bolli</i> | " <i>lyristes</i> |
| <i>Trimerotropis maritima</i> | " <i>exiliscanorus</i> |
| <i>Psinidia fenestralis</i> | " <i>caudellianus</i> (?) |
| <i>Scirtetica marmorata</i> | " <i>nebrascensis</i> |
| <i>Schistocerca americana</i> | " <i>palustris</i> |
| " <i>damnifica</i> | <i>Orchelimum vulgare</i> |
| " <i>alutacea</i> | " <i>glaberrimum</i> |
| " <i>rubiginosa</i> | " <i>herbaceum</i> |
| " sp. (obscura) | " <i>spinulosum</i> |
| <i>Hesperotettix brevipennis</i> | " <i>campestre</i> |
| <i>Melanoplus scudderi</i> | " <i>fidicinium</i> |
| " <i>atlanis</i> | <i>Xiphidium fasciatum</i> |
| " <i>femur-rubrum</i> | |

In the Cape May Peninsula two subdivisions, each with certain distinctive physiographic and biotic features, can usually be distinguished. One of these, which in every respect agrees with the Coastal District as already described, includes the salt marshes, the low forelands just inside of the salt marshes and the beaches. The other subdivision we may speak of as the Interior District. This in its general aspect closely resembles the true Pine Barrens, though differing from the latter in some important respects. It consists of a flat sandy plain, which, except where cleared by human agency, is covered with a practically continuous stretch of oak and pine forest.

The characteristics of the Coastal District, so far as they come

within the scope of this article, have already been considered. In the Cape May region the Coastal District is represented by a narrow strip along the ocean, locally known as "The Seaside," and a similar strip along the shore of Delaware Bay, known as "The Bayside." Both are alike in essential respects, although the beaches are absent or exceptional on the bayside. North of Wildwood Junction the seaside and bayside are entirely separated by the wooded interior, but south of that point, as noted by Stone, the two converge and unite to form a continuous belt of Coastal District country extending clear across the lower third of the peninsula.

The Interior District, as previously mentioned, partakes of the nature of the Pine Barrens. The soil is typically a coarse sand of the Norfolk type. It is similar apparently to the sands of the Pine Barrens, but differs in its usually more humid condition and its higher content of organic matter, a state of affairs doubtless due to the extremely low elevation (rarely over 25 feet above sea-level) and consequent proximity of the surface to underground water. The tree growth consists predominantly of pitch pine (*Pinus rigida*), white oak (*Quercus alba*), post oak (*Q. stellata*) and pig-nut hickory (*Hicoria glabra*); of less frequent occurrence are Jersey pine (*P. virginiana*), black oak (*Q. velutina*), Spanish oak (*Q. triloba*), black-jack (*Q. marylandica*), sassafras (*Sassafras sassafras*) and holly (*Ilex opaca*).

The bogs of the Interior in their general appearance closely resemble those of the Pine Barrens, but, with a few exceptions in the northernmost part of the district, differ from the latter in the conspicuous absence of the white cedar (*Chamaecyparis thyoides*). The usual tree growth consists of red maple (*Acer rubrum*), sour-gum (*Nyssa sylvatica*), magnolia (*M. virginiana*), sweet-gum (*Liquidambar styraciflua*), Spanish oak (*Q. triloba*) and willow oak (*Q. phellos*). The lower scrub growth consists largely of *Clethra alnifolia* and *Azalea viscosa*. In clearings the dominant plants are *Woodwardia virginica*, *Juncus* (tall species, probably *canadensis*) and sedges (*Eriophorum virginicum* and *Rhynchospora alba*); with these are associated lesser numbers of such plants, as *Lilium superbum*, *Aletris farinosa*, *Blephariglottis blephariglottis*, *Pogonia ophioglossoides*, *Drosera longifolia*, *Polygala lutea*, *P. cruciata*, *Rhexia virginiana*, *R. mariana*, *Asclepias pulchra* and *Oxypolis rigidior*.

South of Wildwood Junction the character of the vegetation undergoes a gradual change, assuming more the aspect of the vegetation which is characteristic of the lowland woods of the Delaware Valley and Coastal District. The pitch pine becomes a less important

constituent of the flora, though not uncommon in spots throughout the whole lower part of the peninsula.

Orthoptera, such as we are concerned with in this article, occur in numbers only in those parts of the Interior District where more or less extensive clearings exist in the otherwise continuous forests. Where the clearings are small and entirely surrounded or bordered by the woods, a sylvan type of fauna obtains similar in facies to that of the Pine Barrens, but lacking some of the more distinctive species of the latter, such as *Spharagemon wyomingianum*, *Melanoplus fasciatus* and *impudicus* and *Orchelimum erythrocephalum*. This faunule is best developed in the northern section of the district; in the southern section it appears to be only locally represented.

The species usually associated with the dry pine and oak woods are the following:

| | |
|--------------------------------|----------------------------------|
| <i>Orphulella pelidna</i> | <i>Schistocerca rubiginosa</i> |
| <i>Arphia sulphurea</i> | <i>Melanoplus scudderi</i> |
| <i>Hippiscus phænicopterus</i> | " <i>luridus</i> |
| <i>Spharagemon bolli</i> | <i>Scudderia curvicauda</i> |
| <i>Psinidia fenestralis</i> | " <i>furcata</i> |
| <i>Scirtetica marmorata</i> | <i>Amblycorypha oblongifolia</i> |
| <i>Schistocerca damnifica</i> | <i>Microcentrum</i> sp. |

The bogs are characterized by the presence of the following:

| | |
|------------------------------|--------------------------|
| <i>Schistocerca alutacea</i> | <i>Scudderia furcata</i> |
| <i>Scudderia curvicauda</i> | |

In the extreme southern portion of the peninsula some of the species here listed are apparently only locally represented. This is especially the case with the more characteristic Pine Barren forms, such as *Scirtetica marmorata*, *Melanoplus luridus* and *Schistocerca alutacea* and *rubiginosa*, all of which are abundant in the northern section, but are of only exceptional occurrence in the southern section. Their scarcity is evidently correlated with the absence of typical Pine Barren conditions.

In the Interior District removal of the forest on any extensive scale and the utilization of the land for agricultural purposes is followed by changes in the character of the fauna and flora similar to those taking place under like conditions in the Pine Barrens. The more exclusively sylvan species disappear and their place is taken by campestral types like those of the neighboring Coastal District. I have given especial attention to this matter in the vicinity of South Seaville, where the country adjoining the road connecting the seaside with the bayside has been largely cleared and placed under cultiva-

tion. In this region neglected fields are occupied by a weed vegetation similar to that occurring in similar situations in the Coastal Strip, and this is correlated with the presence of similar species of Orthoptera, the more important species being the following:

| | |
|---|--------------------------------|
| <i>Syrbula admirabilis</i> | <i>Melanoplus femur-rubrum</i> |
| <i>Orphulella pelidna</i> | “ <i>femoratus</i> |
| <i>Arphia xanthoptera</i> | <i>Scudderia curvicauda</i> |
| <i>Chortophaga viridifasciata</i> | “ <i>furcata</i> |
| <i>Hippiscus rugosus</i> | <i>Amblycorypha uhleri</i> |
| <i>Dissosteira carolina</i> | <i>Conocephalus robustus</i> |
| <i>Psinidia fenestralis</i> (local, on bare sandy spots) | “ <i>triops</i> |
| <i>Melanoplus atlantis</i> | <i>Orchelimum vulgare</i> |
| | <i>Xiphidium strictum</i> |

SUMMARY.

1. In the region covered by eastern Pennsylvania and New Jersey two strikingly different types of Orthopteran faunas are exemplified, namely, a Transition fauna in eastern Pennsylvania and northern New Jersey and an Upper Austral fauna in southern New Jersey.

2. In this region the Transition fauna coincides in distribution with the Appalachian Mountain System and the Piedmont Plateau; the Upper Austral fauna with the Coastal Plain.

3. It is not possible with the data at present available to give a complete causal explanation of the observed facts of distribution as exemplified by the Orthoptera of this region.

4. Atmospheric temperature alone does not afford a satisfactory explanation of the facts of distribution; more pertinent is the temperature of the medium in which or on which the organism, or any stage of the organism, dwells. The areal distribution of an organism is probably a resultant of the interaction of a number of factors and not of any one single factor.

5. In the region included in this study the striking differences between the biotas of the Piedmont Plateau and the Coastal Plain are closely correlated with equally striking differences in topography, drainage and soils.

6. The Piedmont Plateau is a region of considerable elevation and good drainage. Permanently wet areas constitute a relatively insignificant feature of the region.

7. The Coastal Plain is a region of very slight elevation and usually poor drainage. Permanently wet areas constitute highly important physiographic features of the region.

8. The soils of the Piedmont Plateau are loams of residual origin.

They are usually rich in moisture and available plant-food elements.

9. The soils of the Coastal Plain are prevailingly relatively coarse sands of detrital origin. They are frequently deficient in moisture and available plant-food elements.

10. From an Orthopteran faunistic standpoint, four primary subdivisions are recognizable in the eastern Pennsylvania-New Jersey region, namely, Appalachian, Piedmont, Coastal and Pine Barren. The first two are subdivisions of the Transition Zone, the last two of the Coastal Plain. Each may be regarded as a local centre of dispersal.

11. From the same standpoint, the Highlands, the Middle District and the Cape May Peninsula are to be considered as of secondary value, each representing a sort of tension zone in which there is an intermingling, overlapping or interdigitation of species from adjoining primary districts.

12. The Orthopteran fauna of the Appalachian District has never been adequately studied from a faunistic standpoint. The available data indicate that it is fundamentally Piedmont in type with the addition of a number of distinctively northern (boreal) species.

13. The Orthopteran fauna of the Highlands has also never been adequately studied. The available evidence indicates that it is thoroughly Piedmont in type with a few stragglers from the Appalachian District.

14. The Orthopteran fauna of the Piedmont Plateau is predominantly mesophilous. This is correlated with the presence of a dominant mesophytic type of vegetation.

15. The Orthopteran ecological associations of the Piedmont Plateau are usually not clearly delimited. In a general way three such groups correlated with the relative moisture content of the habitat may be recognized. These are the mesophilous, xerophilous and hygrophilous associations. Each of these may exhibit an open-country or campestral phase and a woodland or sylvan phase.

16. The mesophilous association is characteristic of rich loamy soils and a luxuriant vegetation, of which the dominant members are bright green, succulent, sod-forming grasses.

17. The xerophilous association of the Piedmont Plateau consists exclusively of the humicolous subdivision; arenicolous and saxicolous species are lacking owing to the absence of pure sand and the scarcity of bare rock surfaces. This association typically occurs on uplands or hillsides where the soil is unsuited for agricultural purposes. The associated vegetation is of a mildly xerophytic type.

18. The hygrophilous association of the Piedmont Plateau is of relatively subordinate importance owing to the limited extent of permanently moist lands. It is not sharply separable from the dominant mesophilous association. It occurs in stream meadows and small wet areas about springs or in seepage depressions. The associated vegetation consists of hydrophytes and mesophytes with hydrophytic tendencies.

19. In each of these associations the dominant phase in the Piedmont Plateau region is the campestral. The sylvan constitutes a relatively insignificant part of the fauna. The removal of the forests and the utilization of the land for farming purposes evidently favor the campestral types, while they restrict the more exclusively sylvan types.

20. The Orthopteran fauna of the Coastal Plain consists of two widely diverse, but important, constituent associations. One of these is a xerophilous association characteristic of the upland, the other a hygrophilous association characteristic of wet or humid areas. Besides these there is a mesophilous association which, however, is of relatively minor importance.

21. In contrast with their indefinite character in the Piedmont, the Orthopteran ecological groups of the Coastal Plain are usually quite clearly defined.

22. The xerophilous association of the Coastal Plain includes both arenicolous and humicolous species. It is typically developed on dry, sandy soils and is associated with a more or less xerophytic type of vegetation.

23. The hygrophilous association of the Coastal Plain is highly developed. It shows three different types in accordance with the nature of the respective environments. These are: (1) the fresh-water-marsh type, (2) the maritime or salt-marsh type, and (3) the peat-bog type. They are associated with hydrophytic (fresh-marsh type) or xerophytic (salt-marsh and peat-bog types) types of vegetation.

24. The mesophilous association of the Coastal Plain is typical of rich, loamy soils and is best represented in the productive farming districts of the Middle District. This association tends to invade other districts when these are placed under cultivation.

25. Primary faunistic subdivisions, or centres of dispersal, of the Coastal Plain are the Coastal and Pine Barren districts; secondary subdivisions, or zones of tension, are the Middle District and Cape May Peninsula. The latter is a minor centre of dispersal for a limited number of southern Orthoptera.

26. The Coastal faunule is composed of four associations, namely, (a) Subcoastal, (b) Littoral, (c) Submaritime and (d) Maritime.

27. The Subcoastal association is characteristic of the upland portions of the Coastal Strip and is associated with a sandy soil, moderate humidity, open campestral country and a mildly xerophytic type of vegetation. The dominant Orthoptera are humicolous xerophiles of the campestral phase, though arenicoles may be locally common. This at the present time appears to be the dominant Orthopteran association of the Coastal Plain. It tends to spread inland with the removal of the forests and there displace the Pine Barren types.

28. The Littoral association is characteristic of the sea-beaches. It is associated with wind-drifted sands and a highly xerophytic type of vegetation. A fairly definite zonation in the distribution of the Orthoptera can be recognized, the outer or frontal dunes being characterized by arenicoles, the leeward dunes by humicoles. Open grass formations prevail on the frontal dunes, dense thickets on the leeward dunes.

29. Human occupation of the beaches is evidently effecting far-reaching changes in the composition of the beach fauna and flora. A number of Subcoastal Orthoptera appear to have been introduced directly or indirectly through human agency.

30. The Submaritime association is a somewhat modified representative of the fresh-water marsh group and is characteristic of the low lands adjoining the salt marshes. It is associated with a muck soil, abundant moisture and a mixed type of vegetation varying from hydrophytes to xerophytes according to location, but consisting mostly of the former.

31. The Maritime association is characteristic of the salt marshes. It is associated with a soil saturated with water and organic debris and with a highly halophytic type of vegetation.

32. The Pine Barren faunule is fundamentally a sylvan group, divisible into a Sand Barren (Pine Barren in the narrower sense) association and a Peat Bog (Cedar Swamp) association. In cultivated areas the sylvicoles are replaced by a campestral association corresponding in essential features to the Subcoastal association of the Coastal District.

33. The Sand Barren association is a distinctively xerophilous group and includes both arenicoles and humicoles, the former prevailing on exposed patches of sand, the latter in the vegetation. It is associated with a sandy soil, low humidity, forested country and a strongly xerophytic type of vegetation.

34. The Peat Bog association is a hygrophilous group associated with a peaty substratum, abundant moisture, forested surroundings and a prevailingly xerophytic type of vegetation.

35. The claim of the Middle District to recognition as a distinct Orthopteran faunistic subdivision of the Coastal Plain rests solely upon the intermingling and overlapping of faunules from the adjoining centres of dispersal. Certain characteristic Piedmont species are entirely or almost entirely limited to this part of the Coastal Plain.

36. The Middle District includes a narrow strip of relatively low land adjoining the Delaware River in southeastern Pennsylvania. Faunistically, this shows considerable differences from the typical Middle District as represented in west Jersey.

37. The Orthopteran faunule of the Pennsylvania subdivision of the Middle District is essentially a Piedmont fauna with which is intermixed a minor constituent of Coastal Plain origin. The latter is best represented in the river marshes.

38. In the Middle District of west Jersey the dominant faunule is the Coastal faunule, the Piedmont faunule being a decidedly minor constituent of the Orthopteran fauna. The Pine Barren faunule is only locally represented.

39. The Piedmont types are frequent in the northern half of the Middle District, but disappear rapidly in the southern section. They are typically associated with the presence of loam soils, a moderate supply of moisture and mesophytic vegetation.

40. The Cape May District includes representatives of two faunules. One, corresponding to the Coastal faunule, characterizes the two sides of the Peninsula and its entire lower third; the other, representing a southward extension of part of the Pine Barren faunule, occupies the interior districts of the northern section.

42. The Interior Orthopteran association of the Cape May District is a typical sylvan group. Clearing of the country and its conversion into farm lands is accompanied by a disappearance of the sylvan types and an invasion of the campestral Subcoastal association.

ANNOTATED LIST OF SPECIES.¹⁹

TRYXALIS Fabr.

T. brevicornis Johann.

GENERAL RANGE.—Southern Ontario and Long Island to southern

¹⁹ In view of the more or less unsettled state of taxonomic nomenclature at the present time, I have chosen to designate the species by the names which have been in current use during the last decade rather than those which belong to them according to the rule of priority.

Florida, west to Texas and eastern Nebraska, typically an Austral species; also in Central and South America.

LOCAL DISTRIBUTION.—Very rare or accidental in the Piedmont Plateau; frequent, but more or less local in the Middle and Coastal Districts of the Coastal Plain, apparently most abundant in the lower Delaware Valley.

ECOLOGICAL DISTRIBUTION.—Largely a Submaritime species, being especially frequent in the patches of *Scirpus americanus* along the borders of the salt marshes, in smaller numbers extending a short distance inland along tidal streams.

LOCALITY RECORDS.—

Piedmont Plateau.—Harrisburg (Pa. St. Dept. Zool.).

Middle District.—Newcastle, Del. (Fox).

Jamesburg (Johnson); Delair (N. J. Coll.); Lucaston (Daecke); Almonesson (Wenzel); Canton (Fox); Dorchester (Fox).

Coastal District.—West Creek (Rehn); Ocean View (Fox); Anglesea (N. J. Coll.); Cold Spring (Long, Fox); Cape May Point (Fox); Goshen (Fox); Dennisville (Davis).

PSEUDOPOMALA Morse.

P. brachyptera Seudd.

GENERAL RANGE.—New England States to Florida, west to Minnesota and Nebraska, most frequent in the northern States, apparently exceptional south of the Middle Atlantic States.

LOCAL DISTRIBUTION.—Usually quite rare and local in both the Piedmont Plateau and Coastal Plain, exceptionally frequent locally. No records from the Pine Barrens.

ECOLOGICAL DISTRIBUTION.—Rather variable in its habitat preferences, frequenting dry, scrubby areas, usually in sylvan surroundings, in inland localities, but along the coast occurring in the Submaritime zone, where it is partial to the *Iva oraria* fringes along the edge of the salt marshes, occasionally spreading to scrubby areas on the adjoining upland.

LOCALITY RECORDS.—

Piedmont Plateau.—Fort Lee, N. J. (Beutenmuller).

Williamson's School, Delaware Co., Pa., on serpentine barren (Long); Fern Hill, Chester Co., Pa., on serpentine, exceptionally common (Hebard and Rehn).

Middle District.—Clementon, N. J., in dry, sandy oak and pine barren (Fox).

Coastal District.—Ocean View, one specimen taken on sandy upland (Subcoastal); another in Submaritime zone along the edge

of the salt marsh (Fox); Goshen, several males taken or observed in *Iva oraria* and *Scirpus americanus* along the edge of the salt marsh (Fox).

MEMIRIA Stal.

M. vigilans Seudd.

GENERAL RANGE.—Southern New Jersey to Florida near the coast.

LOCAL DISTRIBUTION.—Not recorded outside of Cape May County, usually rare and local, most frequent at the extreme southern extremity of the peninsula, apparently very exceptional in the upper part of the county, typically found in the immediate proximity of the coast, but occasionally occurring a short distance inland.

ECOLOGICAL DISTRIBUTION.—Typically a member of the Submaritime association, frequenting the tall sedges and associated thickets along the borders of the salt marshes, rarely occurring inland in open bogs of Pine Barren aspect.

LOCALITY RECORDS.—

Pine Barrens (?).—Belle Plain, Cape May Co., in a bog containing a mixture of Middle District (or Coastal) and Pine Barren plants (*Acer rubrum*, *Betula populifolia*, *Lobelia canbyi*, *Sabatia lanceolata*, *Spirea tomentosa*) (Fox).

Coastal District.—Ocean City (N. J. St. Mus. Rep.); Anglesea (N. J. St. Mus. Rep.); Cape May (N. J. St. Mus. Rep., Fox); Cape May Point (Fox).

SYRBULA Stal.

S. admirabilis Uhl.

GENERAL RANGE.—New Jersey to Florida, west to northern Indiana, Illinois, Kansas and Texas.

LOCAL DISTRIBUTION.—Restricted to the Coastal Plain, most frequent in the lower Middle District and Coastal Strip; less frequent and apparently more or less local in the Pine Barrens. Absent on the beaches.

ECOLOGICAL DISTRIBUTION.—Adapted to a rather wide range of conditions, but occurring most abundantly in dry grasslands on sandy soils, less frequent apparently in open woodland scrub. Typically a member of the Subcoastal association, being frequent in old fields in the Coastal Strip and lower Delaware Valley and in similar situations in the interior of the Cape May Peninsula. In the Pine Barrens it appears to be more common in the vicinity of human habitations than in the more remote and typical portions.

LOCALITY RECORDS.—

Middle District.—Newcastle, Del. (Fox).

Washington Park (Fox); North Woodbury (Viereck); Almonesson (Fox); Blackwood (Fox); Laurel Springs (Fox); Clementon (Fox); Jericho (Fox); Canton (Fox).

Pine Barrens.—Taunton (Stone); Clementon (Fox); Stafford's Forge (Rehn); West Creek (Rehn); Atsion (Hebard); Parkdale (Rehn and Hebard); Manumuskin (Daecke, Fox); Belle Plain (Fox); Mt. Pleasant (Fox); head of Tuckahoe River (Fox).

Coastal District.—Petersburg (Fox); Ocean View (Fox); Cape May (Daecke); Cape May Point (Fox).

Cape May Interior.—Sea Isle Junction (Fox); South Seaville (Fox); Dennisville (Fox); Clermont (Fox).

ERITETTIX Bruner.

E. carinatus Seudd. (= *Simplex* Seudd.).

GENERAL RANGE.—New England to Maryland and southern New Jersey, south in the mountains to northern Alabama.

LOCAL DISTRIBUTION.—Very local and usually rather scarce, occurring in both the Piedmont Region and the Coastal Plain. Not positively recorded from the Middle District and doubtless absent from the beaches.

ECOLOGICAL DISTRIBUTION.—Apparently a humicolous xerophile, preferring dry upland localities on barren soils, covered with coarse grasses and low scrub growth.

LOCALITY RECORDS.—

Piedmont Plateau.—Schwenksville, Montgomery Co., Pa., on trap ridge (Fox); Ashbourne, Philadelphia Co., Pa. (Rehn); Pink Hill, near Newtown Square, Delaware Co., Pa., on serpentine (Rehn and Hebard, Fox); Fern Hill, near West Chester, Pa., on serpentine (Rehn and Hebard).

Pine Barrens.—Between Penbryn and Williamstown Junction, in low blueberry scrub (Fox).

Coastal District.—Ocean View, in dry pasture (Fox).

Cape May Interior.—Sea Isle Junction, in low grass on sand (Fox); Clermont, in low scrub (Fox).

ORPHULELLA Giglio-Tos.

O. speciosa Seudd.

GENERAL RANGE.—Southern Canada and northern United States south to the latitude of Maryland, and in the mountains to northern Alabama, west to Nebraska.

LOCAL DISTRIBUTION.—Quite common, though somewhat local, in the Appalachian, Highland and Piedmont Districts and the Penn-

sylvania portion of the Middle District, extremely scarce and local in the Coastal Plain.

ECOLOGICAL DISTRIBUTION.—A humicolous xerophile, inhabiting fields, pastures, hillsides and woodland borders, preferring areas of coarse grasses on dry, more or less barren or undisturbed soils.

LOCALITY RECORDS.—

Appalachian District.—Ricketts, Wyoming Co., Pa. (Stewardson Brown); Ganoga Lake, Sullivan Co., Pa. (Stewardson Brown); Rockville.

Piedmont Plateau.—Rock Hill, Bucks Co., Pa. (Fox); Perkasio, Bucks Co., Pa. (Fox); Fort Washington, Montgomery Co., Pa. (Fox); Mt. Airy, Philadelphia Co., Pa. (Fox); Germantown, Philadelphia Co. (Fox); Fern Hill, Chester Co. (Hebard and Rehn); Pink Hill, Delaware Co. (Fox); Castle Rock, Delaware Co. (Rehn and Hebard); Bound Brook, N. J. (N. J. St. Mus. Rep.).

Highlands.—Sparta, N. J. (N. J. St. Mus. Rep.); Orange Mts., N. J. (N. J. St. Mus. Rep.).

Middle District.—Bartram's Garden, Philadelphia, Pa. (Fox); common; Elmwood, Philadelphia Co., frequent in dry grassy tracts along the edge of the Tinicum marshes (Fox); Essington, Delaware Co., Pa. (Fox).

Newcastle, Delaware, frequent (Fox).

Washington Park, 1 male (Fox), Almonesson, 1 male, var. *bilineata*, on sandy barren (Fox).

Pine Barrens.—Stafford's Forge; 2 females (Rehn).

Coastal District.—Anglesea, 1 female (N. J. St. Mus.).

REMARKS.—Both the normal and the *bilineata* types occur in our range, the normal being vastly in excess of the latter type, which may be regarded as relatively scarce. In addition there is much variability as regards color and markings in different individuals, these occurring indifferently in both the normal and *bilineata* types. Of the color varieties there are, (a) a form with the ground color a light olivaceous; (b) one in which it is green; (c) a form which may have either of these two ground colors, but has more or less of the upper surface a bright crimson or orange, instead of the usual pale brown. Of the variations in markings there are two forms, one in which the body color is practically uniform, another in which it is conspicuously mottled with darker blotches of black or brown. In our region the most frequent type is the uniformly colored, olivaceous variety, but the others are by no means infrequent.

O. pelidna Burm.

GENERAL RANGE.—Southern New England, Ontario, Michigan and Minnesota, south to Florida and the Gulf States, west to Colorado and New Mexico; most abundant in the Austral zones, especially near the coast, more or less local in the northern and central States.

LOCAL DISTRIBUTION.—Rare or only occasionally frequent locally in the Piedmont Plateau; common locally in the Pennsylvania portion of the Middle District; abundant in all parts of the Coastal Plain, including the beaches.

ECOLOGICAL DISTRIBUTION.—Habitat preferences rather variable, but typically a humicolous xerophile. In the Piedmont Region it is associated with *O. speciosa*; in the Coastal Plain it usually occurs on dry sands or sandy loams wherever there is at least a moderate amount of plant cover in the form of grass or low herbage; less frequently it occurs in open peat-bogs and meadows.

LOCALITY RECORDS.—

Piedmont Plateau.—Perkasie, Bucks Co., Pa., 2 out of 106 *Orphulellæ* were of this species (Fox); Mt. Airy, Philadelphia Co., 19 out of 108 of this species, the rest *speciosa* (Fox); Pink Hill, Delaware Co. (Rehn, Fox); in my own collection 4 out of 49 *Orphulellæ* were of this species.

Middle District.—Bartram's Garden, Elmwood, Philadelphia Co., of 125 *Orphulellæ* 45 were *pelidna* (Fox); Essington, Chester Co., 14 *pelidna* out of a total of 26 *Orphulellæ* (Fox).

Newcastle, Del., frequent (Fox).

Riverton, N. J. (Viereck); Washington Park (Fox), abundant; Almonesson (Fox); Mantua (Fox); Laurel Springs (Fox); Medford (Rehn); Jericho (Fox); Canton (Fox).

Pine Barrens.—Taunton (Stone); Bear Swamp, Burlington Co. (Rehn); Speedwell (Rehn); Clemonton (Rehn, Fox); Penbryn (Fox); between Cedar Grove and Chatsworth (Rehn); Stafford's Forge (Rehn); West Creek (Rehn); Atsion (Hebard); Winslow (Fox); Rosedale (Rehn and Hebard); Parkdale (Rehn and Hebard); Manumuskin (Fox); Belleplain (Fox); Mt. Pleasant (Fox); Formosa Bog (Fox); head of Tuckahoe River (Fox).

Coastal District.—Petersburg (Fox); Palermo (Fox); Seaville (Fox); Ocean View (Fox); Goshen (Fox); Sea Isle City (Fox); Seven-mile Beach (Fox); Anglesea (Fox); Cape May (Viereck, Fox).

Cape May Interior.—Sea Isle Junction (Fox); Ocean View Cemetery (Fox); South Seaville (Fox); Dennisville (Fox); Clermont (Fox); Swain (Fox); Rio Grande (Fox); Bennett (Fox).

REMARKS.—Same color variations in this as in the preceding species.

O. olivacea Morse.

GENERAL RANGE.—Southern Connecticut to Florida, Louisiana and Panama along the coast.

LOCAL DISTRIBUTION.—Common in salt marshes in the Coastal and doubtless also in the lower Middle District.

ECOLOGICAL DISTRIBUTION.—Common on the salt marshes in the short variety of *Spartina glabra*; much less frequent in the Sub-maritime zone and rare on the mainland adjoining the salt marsh.

LOCALITY RECORDS.—

Coastal District.—Atlantic City (Rehn); Beesley's Point (Fox); Sea Isle City (Fox); Ocean View (Fox); Anglesea (A. N. S.); Goshen (Fox).

REMARKS.—This species is much less variable than the two preceding species. The usual color is an olivaceous brown with paler dorsal parts. Individuals with more or less green are not uncommon, but I have never seen a single specimen with the reddish upper parts. Both uniformly colored and mottled individuals occur, the former being more frequent.

DICHROMORPHA Morse.

D. viridis Scudd.

GENERAL RANGE.—Southern New England to Florida, west to Minnesota, Nebraska and Texas.

LOCAL DISTRIBUTION.—Abundant in the Piedmont Region and the Pennsylvania portion of the Middle District; less frequent and largely local in the New Jersey Middle District, becoming rare in its southern part; very local in the northern half of the Pine Barrens; apparently entirely absent from the southern Pine Barrens, Coastal District and Cape May Peninsula.

ECOLOGICAL DISTRIBUTION.—Prevailingly a frequenter of low, humid areas, especially rich, grassy meadows; less frequent but not uncommon in upland situations where there is a thick growth of succulent grasses; occasional in quite dry locations, such as stony hillsides.

LOCALITY RECORDS.—

Highlands.—Boonton, N. J. (G. M. Greene, A. N. S.).

Piedmont Plateau.—Highspire, Dauphin Co., Pa. (Pa. St. Dept. Zool.); Rock Hill, Bucks Co., Pa. (Fox); Perkasio, Bucks Co., Pa. (Fox); Collegeville, Montgomery Co., Pa. (Fox); Fort Washington, Montgomery Co. (Fox); Mt. Airy, Philadelphia Co. (Fox); Fern

Hill, Chester Co. (Rehn and Hebard); Pink Hill, Delaware Co., Pa. (Rehn and Hebard, Fox); Castle Rock, Delaware Co. (Rehn and Hebard).

Middle District.—Tullytown, Bucks Co., Pa. (Fox); Philadelphia Neck (Rehn); Elmwood, in Tinicum Meadows (Fox); Paschalville, Philadelphia Co., in Tinicum Meadows (Fox); Essington (Fox).

Newcastle, Del. (Fox).

Washington Park, Gloucester Co., N. J. (Fox); Mantua (Fox); Almonesson, scarce (Fox); Blackwood, moderately frequent in succulent grass on bank of stream (Fox); Laurel Springs (Fox), not common; Clementon, occasional in open bogs and pond borders (Fox); Bridgeton, several in a small, humid depression (Fox); Jericho, scarce in an open meadow along stream (Fox).

Pine Barrens.—Bear Swamp, Burlington Co. (Rehn); Clementon, occasional (Fox); Penbryn, edge of cedar bog, scarce (Fox); Atsion (Hebard).

REMARKS.—Both brown and green phases occur in our region in approximately equal numbers.

CLINOCEPHALUS Morse.

C. elegans Morse.

GENERAL RANGE.—New Jersey to Florida and Louisiana, mostly near the coast.

LOCAL DISTRIBUTION.—Abundant in the Coastal District and the Maritime portions of the Delaware Valley; rare inland.

ECOLOGICAL DISTRIBUTION.—A characteristic species of the Submaritime zone, frequenting especially the mixed growth of *Spartina patens* and *Juncus gerardi* along the edges of the salt marsh; very exceptional inland in cranberry bogs.

LOCALITY RECORDS.—

Middle District.—Canton, Salem Co., N. J., in Submaritime zone (Fox).

Pine Barrens.—Ocean County, on cranberry bogs, rare (Smith in N. J. St. Mus. Rep.); Belleplain, Cape May Co., in a small, neglected cranberry bog in oak-pine woods, 1 male (Fox).

Coastal District.—West Creek (Rehn); Beesley's Point (Fox); Ocean View (Fox); Sea Isle City (Fox); Seven-mile Beach (Fox); Anglesea (Wenzel); Cape May (Viereck, N. J. St. Mus. Rep., Fox); Goshen (Fox); Cold Spring (Long).

CHLÆALTIS Harris.

C. conspersa.

GENERAL RANGE.—Canadian Provinces to southern New Jersey,

Maryland and Illinois, south in the mountains to North Carolina and Arkansas, west to Alberta, Minnesota and Nebraska.

LOCAL DISTRIBUTION.—Rare and local throughout, except on the beaches from which we have no records.

ECOLOGICAL DISTRIBUTION.—Typically a denizen of moist woodland, frequenting grasses and sedges around wet depressions; in the Coastal District occurring along the outer edge of the Submaritime zone where the latter joins the upland in association with *Iva oraria* scrub.

LOCALITY RECORDS.—

Appalachian District.—Sullivan Co., Pa. (A. N. S.); Culvers Lake, Sussex Co., N. J. (N. J. St. Mus. Rep.).

Highlands.—Lake Hopatcong, Newfoundland (N. J. St. Mus. Rep.).

Piedmont Plateau.—Fort Lee, N. J. (Beutenmuller).

Valley Forge, Chester Co., Pa. (Hebard); Fern Hill, Chester Co. (Rehn and Hebard); Pink Hill, Delaware Co., Pa., grassy borders of stream and adjoining slope on edge of a small grove (Fox); Angora (Greene).

Middle District.—Almonesson, boggy depression in low oak woods (Fox); Clementon, boggy spot in mixed oak and pine woods (Fox).

Pine Barrens.—Lakehurst (Davis); Tuckerton (Davis); Browns Mills Junction (Daecke in N. J. St. Mus. Rep.); Speedwell (Rehn); Atsion (Rehn); Winslow, grassy and scrub undergrowth in moist pine woods (Fox); Parkdale (Rehn and Hebard); Belleplain, grassy and bushy undergrowth in low oak woods surrounding an extensive bog (Fox).

Coastal District.—Ocean View, scarce, but taken regularly in Submaritime zone several seasons in succession (Fox).

STENOBOTHRUS Fisch. (= *Chorthippus* Fieb.).

S. curtipennis Harris.

GENERAL RANGE.—Canadian Provinces to Maryland and Indiana, in the mountains to North Carolina; west to Alberta and eastern Nebraska.

LOCAL DISTRIBUTION.—Abundant in the Appalachian and Piedmont Districts and along both banks of the Delaware River; rare and local elsewhere in the Coastal Plain.

ECOLOGICAL DISTRIBUTION.—A hygrophilous type typical of grassy and sedgy swamps, ditches and stream borders, especially abundant in meadowlands. In the Coastal Plain appears to be largely restricted to the succulent grasses bordering the more open bogs; exceptional in sphagnum and cranberry bogs.

LOCALITY RECORDS.—

Appalachian District.—Ricketts, Wyoming Co., Pa. (S. Brown); Bellasylva, Wyoming Co., Pa. (S. Brown); Ganoga Lake, Sullivan Co., Pa. (S. Brown); Turnersville, Wayne Co., Pa. (B. Long); South Sterling, Wayne Co., Pa. (Long); Loanna, Pike Co., Pa. (Long).

Highlands.—Lake Hopatcong, Sparta, Culvers Lake, Newfoundland, Orange Mts., N. J. (N. J. St. Mus. Rep.).

Piedmont Plateau.—Caldwell, N. J. (N. J. St. Mus. Rep.); Rock Hill, Pa. (Fox); Collegeville, Pa. (Fox); Fort Washington, Pa. (Fox); Fern Hill, Pa. (Rehn and Hebard); Pink Hill, Pa., in “hummock” bog, valley of Fawkes Run (Fox).

Middle District.—Tullytown, Pa. (Fox); Elmwood, Pa. (Fox); Paschalville, Pa. (Fox); Essington, Pa. (Fox).

Jamesburg, N. J. (N. J. St. Mus. Rep.); Washington Park (Fox); Almonesson (Fox); Clementon (Fox).

Pine Barrens.—“Ocean Co.” (Smith, in N. J. St. Mus. Rep.); Folsom, in open bog border, several (Fox); Belleplain, one individual in small cranberry bog in oak and pine woods (Fox).

Coastal District.—Ocean View, very local, moderately frequent in the succulent grass surrounding a *Scirpus americanus* depression near Devaul Run (Fox); Petersburg, small numbers in succulent grass on slope adjoining overflow marsh on Cedar Swamp Creek (Fox); Anglesea (Rehn).

MECOSTETHUS Fieb.**M. lineatus** Seudd.

GENERAL RANGE.—Canadian Provinces to southern New Jersey, Indiana and Illinois, west to eastern Nebraska.

LOCAL DISTRIBUTION.—Appalachian District and Coastal Plain, very local and only exceptionally frequent, usually scarce. Only one record from the Piedmont Plateau. In our region most frequent apparently on the shores of the Delaware River.

ECOLOGICAL DISTRIBUTION.—A strongly hygrophilous species, preferring marshes in which there is a tall and dense growth of grasses and sedges.

LOCALITY RECORDS.—

Appalachian District.—Lopez, Sullivan Co. (Long).

Piedmont Plateau.—Fort Lee (Beutenmüller).

Middle District.—Elmwood in a *Homalocenchrus oryzoides* bog on Tinicum Meadows (Fox); Tinicum Meadows (Rehn and Hebard).

Between Washington Park and Red Bank in a small "hummock" (*Carex stricta* ?) swamp (Fox).

Pine Barrens.—"Ocean Co." on cranberry bog (N. J. St. Mus. Rep.); Lakehurst (*idem.*); between Winslow and Folsom, 1 individual taken in *Woodwardia virginica* patch in peat bog (Fox); Folsom (Rehn and Hebard); Hammonton (N. J. St. Mus. Rep.); Belleplain (Fox), 1 taken in bog.

Coastal District.—Anglesea (N. J. St. Mus. Rep.).

ARPHIA Stal.

A. sulphurea Fabr.

GENERAL RANGE.—Southern New England and Ontario to northern Florida, west to eastern Nebraska and Texas.

LOCAL DISTRIBUTION.—Frequent, though more or less local, throughout the Piedmont Plateau and Coastal Plain; absent on the beaches.

ECOLOGICAL DISTRIBUTION.—A xerophilous species frequenting especially bare soil surfaces usually in the vicinity of woodlands; not infrequent in dry grasslands.

LOCALITY RECORDS.—

Appalachian District.—Rockville (Pa. St. Dept. Zool.).

Piedmont Plateau.—Rock Hill (Fox); Cliffs of the Delaware below Kintnersville (Fox); Trappe (Fox); Valley Forge (Hebard, Fox); Mt. Airy (Fox); Fern Hill (Rehn and Hebard); Pink Hill (Rehn and Hebard, Fox); Castle Rock (Daecke); Williamson School (Long).

Middle District.—Tullytown, on sandy eminence in open woods (Fox); Philadelphia (A. N. S.).

DaCosta (Daecke); Westville (Rehn); Barnesboro (Fox); Almonesson (Fox).

Pine Barrens.—West Plains (Rehn); Clementon (Rehn, Fox); Penbryn (Fox); Winslow (Fox); Parkdale (Rehn and Hebard); Manumuskin (Daecke); Belleplain (Fox); Formosa Bog (Fox).

Coastal District.—Petersburg (Fox); Ocean View (Fox).

Cape May Interior.—Sea Isle Junction (Fox); Ocean View Cemetery (Fox); S. Seaville (Fox); Dennisville (Fox).

A. xanthoptera Burm.

GENERAL RANGE.—Southern New England and Wisconsin, south to Florida and Texas, west to Nebraska.

LOCAL DISTRIBUTION.—Essentially the same distribution as the preceding, but rather more frequent; somewhat local in the Piedmont

Region and Pine Barrens, but common almost everywhere in the Middle and Coastal Districts. Absent or rare on the beaches.

ECOLOGICAL DISTRIBUTION.—Essentially a humicolous xerophile, apparently preferring campestral stations, but not uncommon in very open woodland. Especially frequents dry grasslands; also occurs in numbers on bare loamy and clayey soils, but seems to avoid bare sand.

LOCALITY RECORDS.—

Appalachian District.—Ricketts, Ganoga Lake (S. Brown).

Highlands.—Orange Mts. (N. J. Mus. Rep.); Middlesex Co. (*idem.*).

Piedmont Plateau.—Fort Lee (Beutenmuller).

Rockville (Pa. St. Dept. Zool.); Perkasio, frequent in hillside pasture on stony soil (Fox); Trappe (Fox); Collegeville, upland cornfields, stubble-fields and roadsides, frequent (Fox); Valley Forge, frequent on dry grassy hillsides (Fox); Edge Hill (Long); Ashbourne (Long); Mt. Airy (Fox); Germantown (Fox); Fern Hill (Rehn and Hebard); Pink Hill (Fox).

Middle District.—Philadelphia (Viereck); Elmwood (Fox); Essington (Fox); Newcastle, Del. (Fox).

Riverton (Rehn); Washington Park (Fox); Almonesson (A. N. S., Fox); Blackwoods (A. N. S.); Atco (Rehn); Medford (Stone); Laurel Springs (Fox); Clementon (Rehn, Fox); Jericho (Fox).

Pine Barrens.—Whitings (Rehn); between Cedar Grove and Chatsworth (Rehn); Staffords Forge, in pine woods undergrowth (Rehn); West Creek (Rehn); Atsion (Hebard); Clementon (Rehn, Fox); Manumuskin, most frequent in settlements, infrequent in dry, open patches of bare sand in pine woods (Fox); Belleplain (Fox), mostly in open places; Mt. Pleasant (Fox); Formosa Bog common in a neglected field near an old house, but unusual in the surrounding oak and pine woods (Fox).

Coastal District.—Ocean View, quite frequent in old grassy and weedy fields (Fox); Anglesea (A. N. S.).

Cape May Interior.—Sea Isle Junction (Fox); Ocean View Cemetery (Fox); S. Seaville, especially frequent in old fields (Fox); Clermont (Fox); Dennisville (Fox); Swain (Fox); Bennett (Fox).

REMARKS.—Only the yellow-winged phase of this species seems to occur in any numbers in our region. The red or orange-winged phase I have never seen in the field, though it is possible that it may occur as a very rare variant. This is in marked contrast to the frequency of the red-winged phase in the Central Western States

where it is nearly or quite as common as the yellow phase. The usual explanation that the red-winged phase is due to greater humidity is difficult to harmonize with the almost exclusive prevalence of the yellow-winged type in our region, which is more humid than the States west of the Appalachians.

CHORTOPHAGA Sauss.

C. viridifasciata De Geer.

GENERAL RANGE.—New England States and southern Canada, to Georgia, Minnesota, Colorado and Texas.

LOCAL DISTRIBUTION.—Common throughout the Piedmont Plateau and Coastal Plain, probably also in the Appalachian District. Perhaps a secondary introduction on the beaches. Somewhat local in the Pine Barrens, occurring chiefly near human habitations.

ECOLOGICAL DISTRIBUTION.—Occurs in a wide range of habitats; most typical apparently of relatively dry, open grasslands, but not infrequent in more humid surroundings, such as meadowlands; avoids locations that are actually wet. Less frequent in sylvan habitats than in campestral. Exceptional on bare sand and in low scrubby vegetation.

LOCALITY RECORDS.—

Appalachian District.—Honesdale (Pa. St. Coll.); Rockville (Pa. St. Coll.); Pocono (A. N. S.).

Piedmont Plateau.—Perkasie (Fox); cliffs of the Delaware below Kintnersville (Fox); Schwenksville (Fox); Trappe (Fox); Collegeville (Fox); Eagleville (Fox); Valley Forge (Hebard, Fox); Willow Grove (Fox); Fort Washington (Fox); Edge Hill (A. N. S.); Mt. Airy (Fox); Germantown (Fox); Pink Hill (Rehn and Hebard, Fox); Castle Rock (Rehn and Hebard).

Middle District.—Tullytown (Fox); Elmwood (Fox); Essington (Fox).

Riverton (Rehn); Washington Park (Fox); Medford (Rehn); Lindenwold (Long); Almonesson (Fox); Blackwood (Fox); Barnesboro (Fox); Ashland (Fox); Laurel Springs (Fox); Clementon (Fox); Canton (Fox).

Pine Barrens.—Speedwell (Rehn); Bear Swamp (Rehn); Clementon (Fox); Penbryn (Fox); Winslow (Fox); Elm (Fox); Folsom (Rehn and Hebard); near West Creek (Rehn); head of the Tuckahoe River (Fox); Belleplain (Fox); Mt. Pleasant (Fox); Formosa Bog (Fox).

Coastal District.—Ocean View (Fox); Petersburg (Fox); Sea

Isle City, mostly in neglected lots, on roadsides and railway embankments (Fox); Piermont (Fox); Angelsea (Fox).

Cape May Interior.—Sea Isle Junction (Fox); Ocean View Cemetery (Fox); S. Seaville (Fox); Clermont (Fox); Dennisville (Fox); Swain (Fox); Rio Grande (Fox); Bennett (Fox).

ENCOPTOLOPHUS Seudd.

E. sordidus.

GENERAL RANGE.—Southern Canada to Florida and Texas, west to Nebraska.

LOCAL DISTRIBUTION.—An abundant and characteristic species of the Appalachian and Piedmont Regions; scarce or lacking in the greater part of the Coastal Plain, occurring in numbers only in the Middle District; barely entering the Pine Barrens along their northern and western borders. No records from the remainder of the Pine Barrens, the Coastal District or the Cape May Peninsula.

ECOLOGICAL DISTRIBUTION.—Typically a species of dry grassland, preferring campestral stations; common in old and neglected fields, roadsides, pastures, etc.

LOCALITY RECORDS.—

Appalachian District.—Ricketts (Brown); Ganoga Lake (Brown); Wyoming Co. (A. N. S.); Rockville, Marysville (Pa. St. Dept. Zool.).

Highlands.—Newfoundland (N. J. St. Mus. Rep.).

Piedmont Plateau.—Harrisburg (Pa. St. Dept. Zool.); Perkasio (Fox); Trappe (Fox); Collegeville (Fox); Valley Forge (Fox); Edge Hill (Long); Ashbourne (Long); Lawndale (A. N. S.); Mt. Airy (Fox); Germantown (Fox); Fern Hill (Rehn and Hebard); Pink Hill (Fox); Castle Rock (Rehn and Hebard); Caldwell, Newark, New Brunswick (N. J. St. Mus. Rep.).

Middle District.—Elmwood, Essington, abundant in all relatively dry locations (Fox); Philadelphia (A. N. S.).

Washington Park, abundant in dry grassy locations (Fox); Laurel Springs, frequent in grasslands (Fox).

Pine Barrens.—Ocean Co. (N. J. St. Mus. Rep.); Speedwell (Stone).

CAMNULA Stal.

C. pellucida Seudd.

GENERAL RANGE.—Canadian Provinces to northern Pennsylvania, Indiana and Illinois, west to the Pacific States.

LOCAL DISTRIBUTION.—Apparently quite scarce in the Appa-

lachian District, absent elsewhere. Known by positive record only from northeastern Pennsylvania.

ECOLOGICAL DISTRIBUTION.—Not known from personal investigation, but apparently, according to descriptions of authors, a denizen of dry grasslands.

LOCALITY RECORDS.—

Appalachian District.—Wayne Co., Pa. (Long).

HIPPISCUS Sauss.

H. tuberculatus Beauv. (= *apiculatus* Harris).

GENERAL RANGE.—Canadian Provinces south to southern Pennsylvania, northern Indiana and Illinois, extending in the mountains to North Carolina; west to Alberta, Northwest Territories and Colorado.

LOCAL DISTRIBUTION.—Apparently frequent in the Appalachian District; not uncommon, but more or less local in the Piedmont Plateau. Absent from the Coastal Plain or at most barely entering it along its northern border.

ECOLOGICAL DISTRIBUTION.—Typically restricted to dry grass and scrub lands, usually in the vicinity of woodlands; rarely occurring in damp, upland stream meadows.

LOCALITY RECORDS.—

Appalachian District.—Wayne Co. (Long); Tyrone (Pa. St. Dept. Zool.); Honesdale (*ibid.*); Bendersville (*ibid.*); Huntingdon (*ibid.*); Langsdorf (*ibid.*).

Highlands.—Hewitt (N. J. St. Mus. Rep.); Newfoundland (N. J. St. Mus. Rep.); Great Notch (N. J. St. Mus. Rep.); High Bridge (N. J. St. Mus. Rep.).

Piedmont Plateau.—Cliffs of the Delaware below Kintnersville (Fox); Schwenksville, several in dry roadside vegetation along edge of woods (Fox); Trappe, 1 individual in low thickets near edge of woods (Fox); Eagleville, exceptionally frequent in an upland meadow in long grass adjoining a small stream, not near woodland (Fox); Valley Forge, frequent in clearings and along the edge of woods on high ridge (Fox); Mt. Airy, several taken in a dry, grassy upland field adjoining a small stream (Fox).

Middle District.—Farmingdale (Johnson, in N. J. St. Mus. Rep.).

H. phœnicopterus Germ.

GENERAL RANGE.—Southern New Jersey and southern Illinois to Georgia, Mississippi and Texas, west to southeastern Nebraska.

LOCAL DISTRIBUTION.—Largely restricted to the Coastal Plain,

where it is common in the Pine Barrens and Cape May Peninsula, less frequent and more local in the Middle District and probably accidental on the beaches and in the Piedmont of New Jersey.

ECOLOGICAL DISTRIBUTION.—Characteristic of low, rather open thickets and scrub growth on relatively pure sands, usually in the vicinity of woodlands; less frequent, but not always uncommon in dry, open grasslands.

LOCALITY RECORDS.—

Piedmont Plateau.—Little Falls, Caldwell, New Brunswick (N. J. St. Mus. Rep.).

Middle District.—Almonesson, on sandy barrens, not common (Fox); Turnersville, frequent on upland sand barrens and sandy fields adjoining the woods (Fox).

Pine Barrens.—Speedwell (Rehn); Clementon (Rehn, Fox); Winslow (Fox); Atsion (Hebard and Rehn); head of Batsto (Rehn); Manumuskin (Fox); Mt. Pleasant (Fox).

Coastal District.—Palermo (Fox); Ocean View (Fox); Sea Isle City, 1 individual observed in a vacant lot in the centre of the town, probably accidentally brought over from the mainland (Fox).

Cape May Interior.—Sea Isle Junction (Fox); Ocean View Cemetery (Fox); S. Seaville, largely restricted to wooded areas (Fox); Greenfield (Fox); Clermont (Fox); Swain (Fox); Rio Grande (Fox); Bennett (Fox).

H. rugosus Seudd. (incl. *H. compactus* Seudd.).

GENERAL RANGE.—New England States and Minnesota, south to Florida and Texas, west to Nebraska.

LOCAL DISTRIBUTION.—Very local in the Piedmont Region, but occasionally quite frequent; more abundant, but also somewhat local in the Coastal Plain, apparently having its stronghold in the lower Delaware Valley and Coastal Districts. Seems to be quite exceptional in the Pine Barrens. Rare, possibly accidental, on the beaches.

ECOLOGICAL DISTRIBUTION.—A species of dry or moderately humid grasslands and low scrub, frequenting especially old, neglected fields and woodland borders.

LOCALITY RECORDS.—

Highlands.—Orange Mts. (N. J. St. Mus. Rep.).

Piedmont Plateau.—Bound Brook, New Brunswick, Caldwell (N. J. St. Mus. Rep.).

Perkasie (Fox); Valley Forge (Fox); Fern Hill (Rehn and Hebard); Pink Hill (Fox); Collingdale (Rehn).

Middle District.—Lahaway (N. J. St. Mus. Rep.); Canton (Fox).

Pine Barrens.—Lakewood (N. J. St. Mus. Rep.); head of Tuckahoe River (Fox).

Coastal District.—Ocean View, frequent in old, briery fields and along edge of woods (Fox); Anglesea (N. J. St. Mus. Rep.).

Cape May Interior.—S. Seaville (Fox); Dennisville (Fox); Clermont (Fox)²⁰; Swain (Fox).

REMARKS.—All individuals of this species taken by me were of the yellow-winged variety.

DISSOSTEIRA Seudd.

D. carolina Linn.

GENERAL DISTRIBUTION.—All temperate North America from the Atlantic to the Pacific.

LOCAL DISTRIBUTION.—Abundant in all districts with the possible exception of certain parts of the Pine Barrens.

ECOLOGICAL DISTRIBUTION.—Found in all dry or moderately humid locations where there is more or less bare ground; largely a campestral species, less frequent in sylvan haunts; occurs in fields, meadows, and open woodland, especially abundant on roads, paths, trails, etc.

LOCALITY RECORDS (list includes my own records only).

Piedmont Plateau.—Rock Hill, Perkasio, Collegeville, Valley Forge, Fort Washington, Mt. Airy, Germantown, Pink Hill, Philadelphia.

Middle District.—Tullytown, Elmwood, Paschalville, Essington, Newcastle.

Washington Park, Mantua, Almonesson, Laurel Springs, Clementon, Jericho, Canton.

Pine Barrens.—Clementon, Penbryn, Winslow, most frequent in cleared land, less common in scrub land; Manumuskin, Belleplain, Mt. Pleasant, Formosa Bog, mostly on more open roads and in abandoned fields, infrequent in woodland clearings.

Coastal District.—Petersburg, Palermo, Seaville, Ocean View, Court House, Goshen, Green Creek, Sea Isle City, Townsend Inlet, Seven-mile Beach, Anglesea, Wildwood, Cape May, Dennisville.

SPHARAGEMON Seudd.

S. saxatile Morse.

GENERAL RANGE.—New England States south in the mountains to southern Virginia, locally westwards to Arkansas.

²⁰ The record for Cedar Grove attributed to me in the N. J. St. Mus. Report refers to this Cape May County locality, which is also called Cedar Grove, and not to the Pine Barren locality described under that name in the list of localities.

LOCAL DISTRIBUTION.—Restricted to the Appalachian and Highlands Districts.

ECOLOGICAL DISTRIBUTION.—A distinctively saxicolous species, occurring, according to Morse, on bare rock surfaces, ledges and thinly grassed rocky soil.

LOCALITY RECORDS.—

Appalachian Region.—Lehigh Gap (Rehn).

Highlands.—Newfoundland (Davis, N. J. St. Mus. Rep.).

S. bolli Scudd.

GENERAL DISTRIBUTION.—Temperate North America, west to Colorado and Manitoba.

LOCAL DISTRIBUTION.—Occurs in the Appalachian District; very local and only rarely frequent in the Piedmont Region; more frequent but local in the Middle and Coastal Districts; especially common throughout the Pine Barrens. Not known to occur on the beaches.

ECOLOGICAL DISTRIBUTION.—A typical sylvan species, frequenting the grassy and scrubby undergrowth of dry woodlands.

LOCALITY RECORDS.—

Appalachian Region.—Enola, Rockville (Pa. St. Dept. Zool.); Bella Sylva (Brown); S. Sterling (Long); Pike Co. (Long).

Piedmont Plateau.—Valley Forge (Fox); Mt. Airy, frequent in dry grasses and open scrub in deciduous woodland (Fox); Fern Hill (Rehn and Hebard); Fairview (Rehn).

Middle District.—Almonesson, scarce (Fox); Laurel Springs, frequent (Fox); Jericho, common in sandy barrens (Fox); Canton, in woods (Fox).

Pine Barrens.—Clementon, frequent (Fox); Penbryn (Fox); Winslow, common in blueberry scrub (Fox); Parkdale, common (Rehn and Hebard); Atsion (Hebard); between Cedar Grove and Chatsworth (Rehn); Staffords Forge (Rehn, Rehn and Hebard) in "pine woods undergrowth"; Manumuskin, in blueberry scrub of open pine and oak woods (Fox); Belleplain, common in dry blueberry scrub (Fox); head of Tuckahoe River (Fox); Mt. Pleasant, common in oak and pine woods; Formosa Bogs (Fox); Dennisville, in dry, sandy woods (Fox).

Cape May Interior.—Sea Isle Junction (Fox); Ocean View Cemetery (Fox); S. Seaville, in wooded districts, common (Fox); South Dennisville (Fox); Greenfield (Fox); Clermont (Fox); Swain (Fox); Rio Grande (Fox); Bennett, not common, very local (Fox).

S. collare wyomingianum Thos.

GENERAL RANGE.—Locally throughout the greater part of the

continent, occurring from Canada to the Gulf and west at least to Utah.

LOCAL DISTRIBUTION.—Restricted almost entirely to the Pine Barrens, where it is locally at least quite frequent; occurring also in an outlying sand barren in the lower Delaware Valley.

ECOLOGICAL DISTRIBUTION.—A sand-loving species, frequenting bare patches of relatively pure, white sand and open blueberry scrub on sand.

LOCALITY RECORDS.—

Middle District.—Jericho, in dry wooded sand barrens (Fox).

Pine Barrens.—Clementon, locally frequent on clear, white sand and in thin vegetation (Rehn, Fox); Penbryn, in sandy field (Fox); Jamesburg, on "cranberry bogs" (N. J. St. Mus. Rep.); Atsion (Hebard); Da Costa (Skinner); Folsom, several on sandy railroad bank and in adjoining field (Fox); Parkdale (Rehn and Hebard); Manumuskin, abundant on bare sand and in open scrub in or along the borders of mixed oak and pine woods (Fox).

TRIMEROTROPIS Stal.

T. maritima Harr.

GENERAL RANGE.—Maine to Florida (Caudell) along the coast; also on the shores of the Great Lakes.

LOCAL DISTRIBUTION.—Abundant on the beaches; occasional inland in the remaining parts of the Coastal Plain.

ECOLOGICAL DISTRIBUTION.—Restricted to areas of loose and more or less shifting white sand; especially characteristic of the *Ammophila* covered dunes of the seashore; elsewhere occurring on loose sands in association with a very open formation of coarse grasses.

LOCALITY RECORDS.—

Middle District.—Washington Park, several on loose sand (Fox); Bayside (N. J. St. Mus. Rep.).

Pine Barrens.—Lakehurst (Davis); Folsom, associated with *Spharagemon collare*, several (Fox); Manumuskin, several on sandy bluff overlooking tidal stream (Fox); Mt. Pleasant, one on gravelly road (Fox).

Coastal District.—Sandy Hook (N. J. St. Mus. Rep.); Seaside Park (Long); Atlantic City (Fox); Ocean City (Fox); Sea Isle City (Fox); Townsend Inlet (Fox); Beesley's Point (Fox); Seven-mile Beach; Anglesea (Fox); Cape May (Fox); Cape May Point (Fox); Town bank (Fox).

Cape May Interior.—Sea Isle Junction, a permanent colony in a sand pit (Fox); S. Seaville, stray individual (Fox).

T. citrina Scudd.

GENERAL RANGE.—Apparently widely distributed throughout the eastern and central section of the continent from Canada to the Gulf, but usually very local; most frequent in the Southern States.

LOCAL DISTRIBUTION.—Very rare and local, so far taken in only one locality close to the Appalachian front.

ECOLOGICAL DISTRIBUTION.—Stated to occur on sandy and gravelly river banks and bars.

LOCALITY RECORDS.—Harrisburg (Pa. St. Dept. Zool.).

PSINIDIA Stal.

P. fenestralis Serv.

GENERAL RANGE.—Massachusetts to Florida, mostly in the Atlantic Coastal Plain; also on the shores of the Great Lakes and very local, in isolated sandy areas, in the interior as far west as Nebraska.

LOCAL DISTRIBUTION.—Abundant on bare sandy areas throughout the entire Coastal Plain of New Jersey; no records west of the Delaware River.

ECOLOGICAL DISTRIBUTION.—A sand-loving species frequenting areas of pure white sand, bare or but thinly clothed with low herbage; occurs in both campestral and sylvan locations.

LOCALITY RECORDS.—

Middle District.—Washington Park (Fox); Westville (Rehn); Riverton (G. M. Greene); Almonesson (Fox); Turnersville (Fox); Atco (Rehn); Clementon (Fox); Jericho (Fox).

Pine Barrens.—Whitings (Rehn); Taunton (Stone); Clementon (Rehn, Fox); Sumner (Rehn, Fox); Albion (Rehn, Fox); Penbryn (Fox); Staffords Forge (Rehn); Atsion (Rehn); Winslow (Fox); Parksdale (Rehn and Hebard); Manumuskin (Fox); Belleplain (Fox); Mt. Pleasant (Fox).

Coastal District.—Spray Beach (Rehn); Atlantic City (Rehn); Beesley's Point (Fox); Ocean View (Fox); Sea Isle City (Fox); Seven-mile Beach (Fox); Anglesea (Fox); Cape May (Fox); Cape May Point (Fox).

Cape May Interior.—Sea Isle Junction (Fox); Ocean View Cemetery (Fox); S. Seaville (Fox); Dennisville (Fox); Greenfield (Fox); Clermont (Fox); Swain (Fox); Rio Grande (Fox); Bennett (Fox).

REMARKS.—The vast majority of specimens have decidedly

reddish hind wings; many have orange and occasional examples have them a clear yellow. Light straw or nearly colorless hind wings I have never seen in local material.

SCIRTETICA Sauss.

S. marmorata Harris.

GENERAL DISTRIBUTION.—Coastal Plain from southern Connecticut to Louisiana; locally recorded from southern Ontario and Michigan.

LOCAL DISTRIBUTION.—Abundant in the Pine Barrens and the northern half of the Cape May Peninsula; local elsewhere in the Coastal Plain.

ECOLOGICAL DISTRIBUTION.—A sand-loving species almost entirely restricted to sylvan situations. Occurs on bare sand or in open scrub on sandy soil.

LOCALITY RECORDS.—

Middle District.—Almonesson, scarce (Fox); Turnersville, frequent in sandy upland woods (Fox); Medford (Stone); Jericho, abundant in the wooded sand barrens (Fox); Lucaston (Rehn).

Pine Barrens.—Whitings (Rehn); Speedwell (Rehn); between Harris and White Horse (Rehn); Taunton (Stone); Atco (Rehn); Clementon (Rehn, Fox); Sumner (Fox); Penbryn (Fox); Atsion (Rehn); between Cedar Grove and Chatworth (Rehn); Staffords Forge (Rehn); West Creek (Rehn); East Plains (Rehn); Iona (Daecke); Da Costa (Daecke); Winslow (Fox); Folsom (Rehn and Hebard, Fox); Parkdale (Rehn and Hebard); Manumuskin (Fox); Belleplain (Fox); Mt. Pleasant (Fox); Formosa Bog (Fox).

Coastal District.—Piermont, 1 individual taken on sand at leeward edge of the dune area not far from the so-called "forest."

Cape May Interior.—Sea Isle Junction (Fox); Ocean View Cemetery (Fox); S. Seaville, in dry woods (Fox); Dennisville, in open scrub and on sandy paths in oak and pine woods (Fox); Greenfield (Fox); Clermont (Fox); Swain (Fox); Rio Grande, local (Fox); Cape May Point, frequent on wooded dunes (Fox).

REMARKS.—Three color phases of this species occur in New Jersey. The most frequent is pale gray with darker mottling, giving a color closely simulating sand; a second type is darker, the gray being suffused with dusty-brown; the third type resembles the first, but the body is much speckled with a pale green, giving the creatures a striking resemblance to the crusts of reindeer-moss that are frequent features of their habitat.

CIRCOTETTIX Seudd.

C. verruculatus Kirby.

GENERAL RANGE.—British Provinces and northernmost United States south to the northern borders of New Jersey and Pennsylvania, west to British Columbia.

LOCAL DISTRIBUTION.—Restricted to the mountainous parts of both States.

LOCALITY RECORDS.—

Appalachian District.—Delaware Water Gap (N. J. St. Mus. Rep.).

Highlands.—Dover (N. J. St. Mus. Rep.).

PODISMA.

P. variegata Seudd.

GENERAL RANGE.—Boreal, south in the mountains to North Carolina.

LOCAL DISTRIBUTION.—Restricted to the Appalachian District; apparently rather local.

ECOLOGICAL DISTRIBUTION.—Sylvan, associated especially with hemlock (*Tsuga Canadensis*) woods (Rehn).

LOCALITY RECORDS.—

Appalachian District.—North Mt. (Johnson); Ganoga Lake (Brown); Bellasylva (Behr); Glen Onoko (Huntington).

SCHISTOCERCA Stal.

S. americana Drury.

GENERAL RANGE.—Extreme southwestern Connecticut and southern Ontario to Florida, Texas and South America, especially abundant in the Austral zones.

LOCAL DISTRIBUTION.—Usually rare and local in the Coastal Plain, apparently most frequent and regular on the beaches.

ECOLOGICAL DISTRIBUTION.—So far as I have observed, occurs usually in tall grasses and open scrub; on the beaches frequents the *Andropogon* areas and bayberry scrub.

LOCALITY RECORDS.—

Piedmont Region.—Ft. Lee (Beutenmuller).

Middle District.—Newark (N. J. St. Mus. Rep.); Lahaway (N. J. St. Mus. Rep.); Philadelphia (Skinner, Hebard, Seiss.).

Pine Barrens.—Lakewood (N. J. St. Mus. Rep.).

Coastal District.—Seaside Park (Long); Avalon, scarce (Fox); Anglesea (N. J. St. Mus. Rep.), moderately frequent (Fox); Cape May (N. J. St. Mus. Rep.).

S. damnifica Sauss.

GENERAL RANGE.—New Jersey and southern Indiana to Georgia and Texas.

LOCAL DISTRIBUTION.—Locally frequent throughout the Coastal Plain, except the beach islands on which it seems not to occur.

ECOLOGICAL DISTRIBUTION.—A sylvan species occurring typically in or near dry woodlands, inhabiting low thickets and underbrush; local in open campestral country, persisting in tall grass formations and thickets.

LOCALITY RECORDS.—

Middle District.—Manasquan (Davis); Medford (Stone); Lucaston (N. J. St. Mus. Rep.); Florence (Calvert); Westville (Skinner); Woodbury (Viereck); Almonesson (Fox); Jericho (Fox).

Pine Barrens.—Clemonton (Rehn, Daecke, Viereck); Penbryn (Fox); between head of Batsto and Speedwell (Rehn); Winslow (Fox); Hammonton (N. J. St. Mus. Rep.); Lakehurst (Davis); Lakewood (Davis); Staffords Forge (Rehn).

Coastal District.—Palermo (Fox); Ocean View (Fox).

Cape May Interior.—Ocean View Cemetery (Fox); Bennett (Fox); Clermont (Fox).

S. alutacea Harris (Typical race).

GENERAL RANGE.—Southern Massachusetts to Illinois, Nebraska, Florida, Texas and New Mexico.

LOCAL DISTRIBUTION.—Common in the Pine Barrens and the upper portion of the Cape May Peninsula; very local in the Middle and Coastal Districts; not known with certainty on the beaches.

ECOLOGICAL DISTRIBUTION.—Typically frequenting the rank herbage of sphagnum and cranberry bogs, usually associated with a sylvan environment.

LOCALITY RECORDS.—

Middle District.—Tinicum (Stone).

Riverton (Viereck); Red Bank, 1 female, very aberrant, possibly a hybrid with *americana* (Fox); Jericho (Fox).

Pine Barrens.—Clementon (Rehn, Fox); Winslow (Fox); Folsom (Rehn and Hebard); Atco (Rehn); Speedwell (Rehn); Manahawken (Rehn); West Creek (Rehn); between Cedar Grove and Chatsworth (Rehn); Staffords Forge (Rehn); Whitings (Rehn); Atsion (Hebard); Parkdale (Rehn and Hebard); Manumuskin (Fox); Belleplain (Fox).

Coastal District.—Cape May Court House, in a meadow containing

woodwardia virginica, *Sanguisorba canadensis*, *Eupatorium maculatum*, etc. (Fox).

Cape May Interior.—Sea Isle Junction, in Great Cedar Swamp (Fox); S. Seaville, 1 individual in thicket near head of marshy depression (Fox); Dennisville, in woodland swamp (Fox); Swain (Fox); Nummytown (Fox).

S. rubiginosa Harris (= *rubiginosa* phase of *alutacea*).

GENERAL RANGE.—Apparently co-extensive with that of *alutacea*.

LOCAL DISTRIBUTION.—Occasional or possibly accidental in the Piedmont Plateau; common in the Pine Barrens and upper part of the interior district of the Cape May Peninsula; rare or local in the Middle and Coastal Districts; absent on the beaches.

ECOLOGICAL DISTRIBUTION.—Typical of dry, scrubby areas in oak and pine woods on sandy soils.

LOCALITY RECORDS.—

Piedmont Plateau.—Rockville (Pa. St. Dept. Zool.).

Middle District.—Almonesson, scarce (Fox); Jericho, frequent in sand barrens (Fox).

Pine Barrens.—Whitings (Rehn); between Cedar Grove and Chatworth (Rehn); between Harris and Whitehorse (Rehn); Taunton (Rehn); Staffords Forge (Rehn); Atsion (Hebard); Parkdale (Rehn and Hebard); Manumuskin (Fox); Belleplain (Fox); Woodbine (Fox); Mt. Pleasant (Fox).

Coastal District.—Ocean View, scarce (Fox).

Cape May Interior.—Sea Isle Junction, common in relatively dry locations, not found in Great Cedar Swamp (Fox); Ocean View Cemetery, frequent in low blueberry scrub (Fox); S. Seaville, in open woods and woodland scrub (Fox); Dennisville, in similar locations (Fox); Greenfield (Fox); Clermont (Fox); Swain (Fox); Bennett, scarce in dry wood borders (Fox).

REMARKS.—In addition to typical representatives of the two foregoing races, intermediates, which it is difficult to assign definitely to either race, are common and occur in association with the typical forms.

S. sp. cf. obscura Burm. (= unicolorous phase of *S. obscura* parallel to the *rubiginosa* phase of *alutacea*; a possibility suggested to me by Mr. Rehn).

GENERAL RANGE.—Not known. Typical *obscura* occurs from Maryland to Florida, Texas and Nebraska.

LOCAL DISTRIBUTION.—Restricted to and locally common on the beaches.

ECOLOGICAL DISTRIBUTION.—Characteristic of the fixed dune areas, where it frequents the tall grasses (*Andropogon*) and wax-myrtle thickets.

LOCALITY RECORDS.—

Coastal District.—Beach Haven (Long); Spray Beach (Long); Seaside Park (Long); Townsend's Inlet (Fox); Avalon (Fox); Piermont (Fox); Anglesea (Fox); Cape May (Fox).

HESPEROTETTIX Seudder.

H. brevipennis Thomas.

GENERAL RANGE.—Eastern Massachusetts to Georgia and Alabama.

LOCAL DISTRIBUTION.—Almost entirely restricted to the Pine Barrens, where it is usually rather infrequent, though occasionally moderately frequent in spots. One specimen is recorded from the Cape May Peninsula.

ECOLOGICAL DISTRIBUTION.—Frequents low scrub and undergrowth in mixed pine and oak woods and about the borders of sphagnum bogs.

LOCALITY RECORDS.—

Pine Barrens.—Lakehurst (Davis); Staffords Forge (Rehn); Atsion (Hebard and Rehn); between Winslow and Folsom (Fox); Belleplain (Fox); Mt. Pleasant (Fox); Great Cedar Swamp, north border, near Sea Isle Junction (Fox).

Cape May Peninsula.—Anglesea (Smith), 1 female, exact location of capture not known; it might have been on the mainland opposite the beach.

DENDROTETTIX Riley.

D. quereus Riley.

GENERAL RANGE.—A western species (Nebraska, Missouri, Illinois, Iowa, Texas), known in the east only from New Jersey.

LOCAL DISTRIBUTION.—Usually rare and local in the Pine Barrens, occasionally common (Davis).

ECOLOGICAL DISTRIBUTION.—Frequenting trees and scrub in oak and pine woods (Rehn); feeding on oaks and sumach (Davis).

LOCALITY RECORDS.—

Pine Barrens.—Bamber (Daecke); Ridgeway (Davis); Lakehurst (Davis).

MELANOPLUS Stal.

M. scudderi Uhler.

GENERAL RANGE.—New England to Georgia and Texas, west to Minnesota and Nebraska.

LOCAL DISTRIBUTION.—Locally frequent throughout, except on the beaches where it seems to be lacking; no actual records from the Appalachian Region, but probably occurs there.

ECOLOGICAL DISTRIBUTION.—Typically a sylvan species frequenting grassy and scrubby areas in dry woods; sometimes found away from woodland in thickets, along fences, etc.

LOCALITY RECORDS.—

Highlands.—Hopatcong, Newfoundland (N. J. St. Mus. Rep.).

Piedmont Plateau.—Collegeville (Fox); Chestnut Hill (Hebard); Mt. Airy (Fox); Germantown (Fox); Ashbourne (Long); Castle Rock (Rehn and Hebard).

Middle District.—Riverton (Johnson); Medford (Rehn); Lucaston (Daecke); Almonesson (Wenzel); Laurel Springs (Fox); Jericho (Fox).

Pine Barrens.—Lakehurst (Davis); Atsion (Rehn, Hebard); Da Costa (Daecke); Staffords Forge (Rehn); head of Tuckahoe River (Fox); Belleplain (Fox); Mt. Pleasant (Fox); Formosa Bog (Fox).

Coastal District.—Palermo (Fox); Ocean View (Fox); Goshen (Fox).

Cape May Interior.—Sea Isle Junction (Fox); S. Seaville (Fox); Dennisville (Fox); Greenfield (Fox); Clermont (Fox); Bennett (Long, Fox); Cape May Point (Fox).

M. mancus Smith.

GENERAL RANGE.—New England to northern New Jersey in mountains.

LOCAL DISTRIBUTION.—As yet recorded only from the Highlands of New Jersey.

LOCALITY RECORDS.—

Highlands.—Lake Hopatcong (N. J. St. Mus. Rep.).

M. tribulus Morse.

GENERAL RANGE.—Southern Pennsylvania and New Jersey to Georgia.

LOCAL DISTRIBUTION.—Rare and local, recorded so far from the Serpentine (or Conowingo) Barrens of southeastern Pennsylvania and from the Pine Barrens and northern border of the Cape May Peninsula.

ECOLOGICAL DISTRIBUTION.—Grassy and scrubby undergrowth of dry woodlands and thickets along their borders.

LOCALITY RECORDS.—

Piedmont Plateau.—Pink Hill (Rehn and Hebard).

Pine Barrens.—Staffords Forge (Rehn); Belleplain (Fox).

Cape May Interior.—Sea Isle Junction (Fox).

M. fasciatus Walker.

GENERAL RANGE.—Canadian Provinces to northern Illinois and Indiana and southern New Jersey, south in the mountains to northern Alabama, west to Colorado and British Columbia.

LOCAL DISTRIBUTION.—Occurs in the Appalachian Region. No records of its occurrence in the Piedmont Plateau. Locally frequent throughout the Pine Barrens; occasional in the extreme upper part of the Cape May Peninsula.

ECOLOGICAL DISTRIBUTION.—Frequents the low scrub and undergrowth of dry woods; at times also found about the margins of bogs.

LOCALITY RECORDS.—

Appalachian District.—Bellasyva (Stone); Lehigh Gap (Rehn).

Pine Barrens.—Jamesburg (Beutenmüller); Clementon (Fox); Whittings (Rehn); Speedwell (Rehn); Whitehorse (Rehn); Cedar Grove (Rehn); Staffords Forge (Rehn); Atsion (Rehn); between Winslow and Folsom (Fox); Parkdale (Rehn and Hebard); Da Costa (Daecke); Manumuskin (Daecke, Fox).

Cape May Interior.—Sea Isle Junction (Fox).

M. atlantis Riley.

GENERAL RANGE.—Canadian Provinces to Florida, Texas, Utah and Arizona.

LOCAL DISTRIBUTION.—Recorded from the Appalachian District; common, though somewhat local, in the Piedmont Plateau; plentiful in the Coastal Plain, especially in the Middle and Coastal Districts; more local in the Pine Barrens. Absent from the beaches.

ECOLOGICAL DISTRIBUTION.—A xerophilous species of campestrial tendencies, preferring open, dry grasslands on sandy soils.

LOCALITY RECORDS.—

Appalachian District.—Lehigh Gap (Rehn).

Piedmont Plateau.—Valley Forge (Fox); Germantown (Fox); Pink Hill (Fox); Castle Rock (Rehn and Hebard).

Middle District.—Tullytown (Fox); Philadelphia (A. N. S.); Elmwood (Fox).

Riverton (Viereck); Atco (Rehn); Washington Park (Fox); Woodbury (Viereck); Mantua (Fox); Almonesson (Fox); Laurel Springs (Fox); Clementon (Fox).

Pine Barrens.—Clementon (Fox); Albion (Rehn); Penbryn (Fox); Winslow (Fox); Atsion (Hebard); Folsom (Rehn and Hebard); Parkdale (Rehn); Staffords Forge (Rehn); Manumuskin (Fox); Belleplain (Fox); Mt. Pleasant (Fox).

Coastal District.—Petersburg (Fox); Ocean View (Fox).

Cape May Interior.—Sea Isle Junction (Fox); Ocean View Cemetery (Fox); S. Seaville (Fox); Dennisville (Fox); Clermont (Fox); Cape May Court House (Long); Bennett (Fox); Cape May Point (Fox).

M. femur-rubrum De Geer.

GENERAL RANGE.—Canadian Provinces to the Gulf States, west to British Columbia, Utah and New Mexico, most abundant east of the Rocky Mountains.

LOCAL DISTRIBUTION.—The most abundant species throughout, except in the Pine Barrens where it is rather local, occurring almost exclusively in cultivated areas and old fields (Rehn).

ECOLOGICAL DISTRIBUTION.—Adapted to a wide range of environmental conditions, but partial to more or less humid surroundings; largely avoids extremely dry areas, such as bare sand, or open plant formations on dry soils. Its stronghold is in the low, marshy grasslands in the river valleys and along the edges of the salt marshes, but it is also abundant, though perhaps slightly less so, in all upland districts which are under cultivation and which have a nearly continuous cover of grasses.

LOCALITY RECORDS.—It is needless to give a list of localities, since it would include about every place in which Orthoptera have been collected.

M. minor Scudd.

GENERAL RANGE.—Largely boreal, from the Canadian Provinces to southern New Jersey, Virginia, Indiana, Illinois, Nebraska and Colorado.

LOCAL DISTRIBUTION.—Frequent locally in the Piedmont Plateau, doubtless also in the Appalachian Region; rare in the Coastal Plain.

ECOLOGICAL DISTRIBUTION.—Typical of relatively dry ground covered with coarse grasses and low scrub in the vicinity of woodlands.

LOCALITY RECORDS.—

Appalachian Region.—S. Sterling (Long).

Piedmont Plateau.—Palisades of the Hudson (Beutenmüller); cliffs of the Delaware below Kintnersville (Fox); Valley Forge,

frequent in open places in dry woods and in dry, grassy fields adjoining the woods (Fox); Fort Washington (Fox); Mt. Airy, frequent on dry hillside associated with *Andropogon* (Fox); Germantown (Fox); Fern Hill (Rehn and Hebard); Williamson's School, on Serpentine (Long); Pink Hill (Rehn and Hebard, Fox); Castle Rock (Rehn and Hebard).

Middle District.—Philadelphia (Rehn); Essington (Fox).

Jamesburg (Davis); Atco (Seiss); Westville (Johnson).

Pine Barrens.—Lakehurst (Davis); Speedwell (Rehn); Clementon (Long); Belleplain (Fox).

Cape May Interior.—Sea Isle Junction, several taken in low bunch-grasses on sandy soil (Fox).

M. luridus Dodge.

GENERAL RANGE.—Canada to southern New Jersey and in the mountains to Georgia, west to Manitoba, Minnesota, Colorado, Oklahoma and Texas.

LOCAL DISTRIBUTION.—Very common in the Pine Barrens and upper Cape May Peninsula; local in the Piedmont Plateau and Middle District. No records from the Coastal District.

ECOLOGICAL DISTRIBUTION.—A characteristic sylvan species, frequenting the undergrowth and border vegetation of dry woodlands.

LOCALITY RECORDS.—

Piedmont Plateau.—Mt. Airy, frequent in a grove associated with *Spharagemon bolli* and *Orphulella speciosa* and *pelidna* (Fox); Fairmount Park, Philadelphia (Rehn).

Middle District.—Laurel Springs (Fox); Jericho, in sandy barrens (Fox).

Pine Barrens.—Whitings (Rehn); between Cedar Grove and Chatsworth (Rehn); Staffords Forge (Rehn); Atsion (Rehn); White Horse (Rehn); Clementon (Fox); Penbryn (Fox); Sumner (Long);²¹ between Winslow and Folsom (Fox); Manumuskin (Fox); Belleplain (Fox); Mt. Pleasant (Fox); Formosa Bog (Fox).

Cape May Interior.—Sea Isle Junction (Fox); Ocean View Cemetery (Fox); Dennisville (Fox); Greenfield (Fox); Clermont (Fox); Swain (Fox).

M. impudicus Seudder.

GENERAL RANGE.—Southern New Jersey and southern Indiana and Illinois to the Gulf States, west to Oklahoma.

²¹ I include the *M. keeleri* of the State Mus. Report under this species.

LOCAL DISTRIBUTION.—Restricted to the Pine Barrens, where it appears to be only locally frequent.

ECOLOGICAL DISTRIBUTION.—Apparently similar to *luridus*, with which it was associated in the only locality where I have collected it. Always in our region in pine or mixed pine and oak woods.

LOCALITY RECORDS.—

Pine Barrens.—Jamesburg (Davis); East Plains (Davis); Lakehurst (Davis); White Horse (Rehn); near Harris (Rehn); Staffords Forge (Hebard); Atsion (Rehn, Hebard); Manumuskin, quite common in the undergrowth and in the border shrubbery of mixed oak and pine woods (Fox).

M. stonei Rehn.

GENERAL RANGE.—Pine Barrens of New Jersey.

LOCAL DISTRIBUTION.—Restricted to the Pine Barrens, and so far reported only from its northern portion.

ECOLOGICAL DISTRIBUTION.—“Low scrub under mixed pine and oak and bare sand near pine woods” (N. J. St. Mus. Rep.).

LOCALITY RECORDS.—

Pine Barrens.—Between Harris and White Horse (Stone and Rehn); Atsion (Rehn); Staffords Forge (Rehn).

M. differentialis (Thomas).

GENERAL RANGE.—Southern Michigan and Minnesota to southeastern Tennessee, Louisiana and Texas, west to the Rocky Mts.; local east of the Alleghanies in the vicinity of Philadelphia.²²

LOCAL DISTRIBUTION.—Abundant, at least locally, in the low marshy lands adjoining the lower Delaware River and its tributaries.

ECOLOGICAL DISTRIBUTION.—Characteristic of alluvial lowlands, frequenting the dense succulent grasses of the marshes—*e.g.*, *Homalocenchrus oryzoides*—and the rank vegetation about their borders, especially the tall ragweed (*Ambrosia trifida*); spreading from such locations to the adjoining upland fields and gardens.

LOCALITY RECORDS.—

Middle District.—Philadelphia (Seiss, Rehn); West Philadelphia, in Botanic Gardens of the Univ. of Pa. on gravelly upland (Fox); Bartram's Garden, in fields and thickets on upland terrace (Fox); Philadelphia Neck (Rehn); Elmwood, in Tinicum Meadows, abundant (Fox); Essington, in Tinicum Meadows, frequent (Fox); Newcastle, frequent in rank vegetation bordering Delaware River marshes (Fox).

²² See Rehn, *Canad. Entom.*, Vol. XXXII, 1939, p. 28.

Riverton (Rehn); Camden (Kemp, N. J. St. Mus. Rep.); Westville (Johnson); Red Bank, common in rank growth along river marshes (Fox); Dennisville, 1 male, moist environment, evidently near salt marsh (Davis in personal letter).

M. femoratus Burm.

GENERAL RANGE.—Canadian Provinces to Virginia and Kentucky, in the mountains to Georgia and Alabama, west to the Pacific States, mostly northern in distribution.

LOCAL DISTRIBUTION.—Very common in the Piedmont Plateau and probably also in the Appalachian Region; common, but rather more local in the Coastal Plain, least frequent in the Pine Barrens and on the beaches, probably being a secondary introduction on the latter.

ECOLOGICAL DISTRIBUTION.—Adapted to a wide variety of conditions, but seems to prefer more or less humid tracts with a continuous cover of succulent grasses and other vegetation; not infrequent, however, in quite dry situations where there is considerable cover. It occurs in both campestral and sylvan stations.

LOCALITY RECORDS.—

Appalachian Region.—Pike County (A. N. S.); S. Sterling (Long); Lehigh Gap (Rehn).

Piedmont Plateau.—Harrisburg (Pa. St. Dept. Zool.); Rock Hill (Fox); Fort Washington (Fox); Valley Forge (Hebard); Mt. Airy (Fox); Germantown (Fox); Fern Hill (Rehn and Hebard); Williamson School, Serpentine Barrens (Long); Pink Hill (Fox); Castle Rock (Rehn and Hebard); West Philadelphia (Fox).

Middle District.—Tullytown (Fox); Elmwood, in Tinicum meadows (Fox); Paschalville (Fox); Essington (Fox); Newcastle (Fox).

Washington Park (Fox); Red Bank (Fox); Almonesson (Fox); Blackwood (Fox); Mantua (Fox); Jericho (Fox); Canton (Fox).

Pine Barrens.—Between Cedar Grove and Chatsworth (Rehn); West Creek (Rehn); Atsion (Rehn); Clementon (Fox); Winslow (Fox); Parkdale (A. N. S.); Rosedale (Rehn and Hebard); Manumuskine (Fox); Belleplaine (Fox), most frequent in cultivated areas; Mt. Pleasant (Fox); Formosa Bog (Fox); head of Tuckahoe River (Fox).

Coastal District.—Ocean View, frequent in grassy areas and thickets (Fox); Anglesea, scarce (Fox).

Cape May Interior.—Sea Isle Junction (Fox); Ocean View Cemetery (Fox); S. Seaville (Fox); Dennisville (Fox).

M. punctulatus Scudd.

GENERAL RANGE.—Northern; Canadian Provinces to New Jersey, North Carolina, Indiana and Nebraska.

LOCAL DISTRIBUTION.—Reported from the New Jersey Highlands and the northern section of the Pine Barrens.

ECOLOGICAL DISTRIBUTION.—A sylvan species of more or less arboreal habits, frequenting the trunks and branches of trees especially pine trees (Walker).

LOCALITY RECORDS.—

Highlands.—Newfoundland (Davis).

Pine Barrens.—Lakehurst (Davis); Browns Mills (Daecke); Staffords Forge (Hebard); Ocean Co. about cranberry bogs (Smith).

PAROXYA Scudder.**P. floridiana** Scudder.

GENERAL DISTRIBUTION.—Eastern Massachusetts and southern Ontario to Florida and Texas, mostly near the coast.

LOCAL DISTRIBUTION.—Very exceptional in the Piedmont Region; abundant in suitable locations in the Middle and Coastal Districts; much less frequent and apparently quite local in the Pine Barrens and upper part of the interior of the Cape May Peninsula. Abundant on the beaches.

ECOLOGICAL DISTRIBUTION.—A strongly hygrophilous species, frequenting the dense rank grasses and sedges of open marshes, fresh water and subaritime, but not occurring in true salt marsh.

LOCALITY RECORDS.—

Piedmont Plateau.—Harrisburg, in Wetzels Swamp (Pa. St. Dept. Zool.).

Middle District.—Cornwalls (Rehn); Elmwood, in Tinicum marshes (Fox); Paschalville, in Tinicum marshes (Fox); Essington, in Tinicum marshes, especially in the rank growth of *Sagittaria* and associated plants along ditches (Fox); Newcastle (Fox).

Riverton (Vioreck); Washington Park (Fox); Westville (Vioreck); Blackwood (Fox); Clementon, in sedgy bog (Fox); Jericho, in open meadow along stream (Fox); Canton, in wet places along the edge of the salt marsh (Fox).

Pine Barrens.—Bear Swamp (Rehn); Clementon (Rehn); Folsom, frequent in open bog associated with *P. scudleri* (Fox); Rosedale (Rehn and Hebard); Manumuskin, in rank growth of rice grass, *Zizania palustris*, on tidal mudflats (Fox); Belleplain, in open bog containing mixture of Pine Barren and Coastal floras (Fox); Great Cedar Swamp near Sea Isle Junction, not common (Fox).

Coastal District.—Near West Creek (Rehn); Ocean View, common in tall grasses and sedges along the borders of the salt meadows (Fox); Dennisville, abundant in dense growths of tall grass, *Spartina cynosuroides*, bordering the salt marsh (Fox); Cape May Court House, abundant in a low marshy area leading toward the salt marsh (Fox); Goshen, in *Spartina cynosuroides* on tidal flat (Fox); Ocean City (A. N. S.); Avalon, in humid tracts in the dune depressions or along the edges of the salt marsh (Fox); Piermont (Fox); Anglesea (A. N. S., Fox); Cape May (Fox).

Cape May Interior.—Swain, in peat bogs (Fox).

P. soudderi Blatchley.

GENERAL RANGE.—Reported so far from northern Indiana and Illinois and the Pine Barrens of New Jersey and North Carolina.

LOCAL DISTRIBUTION.—Moderately frequent in the bogs of the Pine Barrens, apparently occasionally intruding into the Coastal District along their edges.

ECOLOGICAL DISTRIBUTION.—A characteristic species of the sphagnum bogs, frequenting especially the areas of chain-fern, *Woodwardia virginica*.

LOCALITY RECORDS.—

Pine Barrens.—Jamesburg (Davis); Lakehurst (Davis); Speedwell (Rehn); Bear Swamp (Rehn); Atco (Rehn); Atsion (Rehn); Staffords Forge (Rehn); Folsom (Rehn and Hebard, Fox); Rosedale (Rehn and Hebard); Parkdale (Rehn and Hebard); Belleplain (Fox); Great Cedar Swamp near Sea Isle Junction (Fox).

Coastal District.—Seaville, 1 individual taken in a *Scirpus americanus* bog adjoining a rivulet draining a near-by cedar-bog (Fox).

SCUDDERIA Stal.

S. texensis Sauss.-Pict.

GENERAL DISTRIBUTION.—New England and Ontario to Florida and Texas, west to the Great Plains.

LOCAL DISTRIBUTION.—Relatively infrequent and local in the Piedmont Plateau; common in the Middle and Coastal Districts; apparently less frequent in the Pine Barrens and the interior of the upper Cape May Peninsula. Frequent on the beaches.

ECOLOGICAL DISTRIBUTION.—Typical of low humid areas, frequenting the rank vegetation in the vicinity of marshes; less frequent, but not uncommon, on the adjoining uplands and along the borders of dry or moist woodlands.

LOCALITY RECORDS.—

Appalachian Region.—Rockville (Pa. St. Dept. Zool.).

Highlands.—Hewitt (Davis).

Piedmont Plateau.—Harrisburg (Pa. St. Dept. Zool.); Perkasio (Fox), on hillside in scrubby area along edge of a small grove; Montgomery Co. (Rehn).

Middle District.—Philadelphia Neck (Rehn); Tinicum (Rehn and Hebard); Elmwood, in Tinicum meadows (Fox); Paschalville, in Tinicum meadows (Fox); Essington (Fox); Newcastle (Fox).

Washington Park (Fox).

Pine Barrens.—Between Cedar Grove and Chatsworth (Rehn); Atsion (Hebard); Staffords Forge (Rehn).

Coastal District.—Ocean View, common in fresh meadows (Fox); Goshen (Fox); Sea Isle City (Fox); Seven-mile Beach (Fox); Anglesea (Fox); Cape May (Fox).

S. curvicauda (De Geer).

GENERAL RANGE.—Canadian Provinces to Florida and Texas, west to the Plains.

LOCAL DISTRIBUTION.—Frequent throughout, except in the Coastal District from which I have no records of its occurrence.

ECOLOGICAL DISTRIBUTION.—Essentially a sylvan species, frequenting the trees and underbrush of both dry and moist woodlands, less frequent in the border-thickets of open meadowlands.

LOCALITY RECORDS.—

Appalachian District.—Rockville (Pa. St. Dept. Zool.).

Piedmont Plateau.—Caldwell (Crane); Penryn (Pa. St. Dept. Zool.); Rock Hill (Fox); Fort Washington (Fox); Montgomery Co. (Rehn); Mt. Airy (Fox); Pink Hill (Fox).

Middle District.—Philadelphia Neck (Rehn); Tinicum (Rehn and Hebard); Elmwood (Fox); Riverton (Viereck); Laurel Springs (Fox).

Pine Barrens.—Clementon (Fox); Atco (Rehn); Atsion (Rehn); between Harris and White Horse (Rehn); Parkdale (Rehn and Hebard); Belleplain (Fox); Mt. Pleasant (Fox); Formosa Bog (Fox).

Cape May Interior.—Sea Isle Junction (Fox); Swain (Fox); Rio Grande (Fox).

S. fuscata Bruner.

GENERAL RANGE.—Canadian Provinces to the Gulf States, west to the Rocky Mts.

LOCAL DISTRIBUTION.—Frequent throughout, except on the beaches, where it seems to be rather scarce.

ECOLOGICAL DISTRIBUTION.—Occurs in a variety of habitats, both sylvan and campestral, frequenting trees, scrubby areas and thickets.

LOCALITY RECORDS.—

Appalachian District.—Wayne Co. (Long).

Piedmont Plateau.—Honesdale (Pa. St. Dept. Zool.); Dauphin (*ibid.*); Camphill (*ibid.*); Catawissa (*ibid.*); Harrisburg (*ibid.*); Rock Hill (Fox); Collegeville (Fox); Valley Forge (Fox); Mt. Airy (Daecke); Collingdale (Rehn); Swarthmore (Rehn).

Middle District.—Riverton (Viereck); Woodbury (Hardenburg); Jericho (Fox); Canton (Fox).

Pine Barrens.—Clementon (Rehn); Staffords Forge (Rehn); Belleplain (Fox); Mt. Pleasant (Fox); Formosa Bog (Fox).

Coastal District.—West Creek (Rehn); Ocean View (Fox); Goshen (Fox); Avalon, rare (Fox); Anglesea, rare (Fox).

Cape May Interior.—Ocean View Cemetery (Fox); Greenfield (Fox); Clermont (Fox); Cape May Point (Fox).

S. pistillata Bruner.

GENERAL RANGE.—Canadian Provinces to New Jersey and northern Indiana, west to Manitoba.

LOCAL DISTRIBUTION.—Apparently scarce, probably largely restricted to the northern districts.

ECOLOGICAL DISTRIBUTION.—“Occurs with the other species” (Beutenmüller, in N. J. St. Mus. Rep.).

LOCALITY RECORDS.—

Highlands.—Chester (N. J. St. Mus. Rep.).

Middle District.—Lucaston (Daecke).

S. septentrionalis Serv.

GENERAL RANGE.—Apparently boreal, south to New Jersey.

LOCAL DISTRIBUTION.—Apparently scarce; reported from the Highlands and Pine Barrens.

ECOLOGICAL DISTRIBUTION.—No data seen.

LOCALITY RECORDS.—

Highlands.—Ramsey, Lake Hopatcong (N. J. St. Mus. Rep.).

Pine Barrens.—Vineland (N. J. St. Mus. Rep.).

S. truncata Beut.

GENERAL RANGE.—So far as I am aware, not taken outside the Pine Barrens of New Jersey.

LOCAL DISTRIBUTION.—Probably very rare, known only, so far as I am aware, from one locality in the Pine Barrens.

ECOLOGICAL DISTRIBUTION.—No data seen.

LOCALITY RECORD.—

Pine Barrens.—Vineland (Beutenmüller).

AMBLYCORYPHA Stal.

A. oblongifolia De Geer.

GENERAL DISTRIBUTION.—Southern Canada south to Georgia, west to the Great Plains.

LOCAL DISTRIBUTION.—Moderately frequent throughout, except on the beaches, where it seems to be lacking.

ECOLOGICAL DISTRIBUTION.—A sylvan species, frequenting scrub growth and borders of woodland.

LOCALITY RECORD.—

Piedmont Plateau.—Harrisburg (Pa. St. Dept. Zool.); Camphill (Pa. St. Dept. Zool.); Highspire (Pa. St. Dept. Zool.); Eberly's Mill (Pa. St. Dept. Zool.); Chestnut Hill (Hebard); Mt. Airy (Daecke); Ashbourne (Long).

Middle District.—Canton (Fox).

Pine Barrens.—Da Costa (Daecke); Atsion (Rehn); Atco (Rehn); Staffords Forge (Rehn and Hebard).

Coastal District.—Absecon (A. N. S.); Ocean View (Fox).

Cape May Interior.—Greenfield (Fox).

A. rotundifolia Scudder.

GENERAL RANGE.—Similar to that of the preceding.

LOCAL DISTRIBUTION.—As in the preceding, but less frequent apparently.

ECOLOGICAL DISTRIBUTION.—As in the preceding species.

LOCALITY RECORDS.—

Appalachian District.—Rockville (Pa. St. Dept. Zool.).

Highlands.—Sparta (Davis); Newfoundland (Davis); Chester (N. J. St. Mus. Rep.).

Piedmont Plateau.—Harrisburg (Pa. St. Dept. Zool.); Ft. Lee (Davis).

Middle District.—Tinicum (Rehn and Hebard).

Pine Barrens.—Lakehurst (Davis); Staffords Forge (Rehn); Weymouth (Daecke); Atco (Rehn); Manumuskin (Daecke).

Coastal District.—Morgan (Davis).

Cape May Interior.—Sea Isle Junction (Fox).

A. uhleri Bruner.

GENERAL RANGE.—Southern New Jersey to Florida and southern Illinois and Indiana.

LOCAL DISTRIBUTION.—Confined to the Coastal Plain, where it usually appears to be of infrequent occurrence, though in some seasons it may be fairly common. Does not seem to occur on the beaches.

ECOLOGICAL DISTRIBUTION.—Seems, so far as my experience with it goes, to be more campestral in its habitat preferences than the other species of the genus. Frequents low scrub and grassy thickets in dry locations.

LOCALITY RECORDS.—

Middle District.—Lucaston (N. J. St. Mus. Rep.); Jericho, in sandy barrens (Fox).

Pine Barrens.—Atsion (Hebard); Parkdale (Rehn and Hebard).

Coastal District.—Ocean View (Fox).

Cape May Interior.—Sea Isle Junction (Fox); S. Seaville (Fox); Clermont (Fox).

MICROCENTRUM Scudd.

M. rhombifolium Sauss. (= *laurifolium* Linn.).

M. retinerve Burm.

PTEROPHYLLA Kirby (= *Cyrtophyllus*).

C. perspicillatus Linn.

The three preceding species are the more strictly arboreal forms, which were not studied in connection with the present investigation. The few specimens which I took add practically nothing to the data already published elsewhere.

CONOCEPHALUS Thunberg of authors.

(= *Conocephaloides* Perkins.)

C. robustus Scudder.

GENERAL RANGE.—Coastal New England south near the coast to North Carolina; local in the interior, especially about the region of the Great Lakes.

LOCAL DISTRIBUTION.—Of common occurrence throughout the Coastal Plain, especially in the Middle and Coastal Districts; rather local apparently in the Pine Barrens. Frequent on the beaches.

ECOLOGICAL DISTRIBUTION.—Typical of tall, grassy thickets in both moist and dry situations. Largely limited to campestral stations. Not frequent in salt marshes.

LOCALITY RECORDS.—

Middle District.—Philadelphia Neck (Rehn); Elmwood, in Tinicum meadows (Fox); Essington, in Tinicum meadows (Fox).

Washington Park (Fox); Almonesson (Fox); Clementon (Fox); Jericho (Fox).

Pine Barrens.—Clementon (Fox); Atsion (Rehn); Manumuskine (Fox); Mt. Pleasant (Fox); Jamesburg (N. J. St. Mus. Rep.).

Coastal District.—Hackensack meadows (N. J. St. Mus. Rep.); Spray Beach (Long); Ocean View, frequent on upland and along the edge of the salt marsh; found on salt marsh in the vicinity of artificial embankments (Fox); Sea Isle City (A. N. S., Fox); Avalon, Piermont, Anglesea (Viereck, Fox); Cape May (Fox).

Cape May Interior.—Sea Isle Junction (Fox); Ocean View Cemetery (Fox); S. Seaville (Fox).

C. triops Linn.

GENERAL RANGE.—I have been able to get very little data on the general distribution of this species. It is, to my knowledge, recorded from Connecticut, New Jersey, Pennsylvania, North Carolina and Texas. It does not appear to occur west of the Alleghenies.

LOCAL DISTRIBUTION.—Frequent in the Piedmont Plateau and Coastal Plain, though apparently rather infrequent and local in the Pine Barrens and on the beaches.

ECOLOGICAL DISTRIBUTION.—Prefers areas of open grassland, wherever the plant cover is sufficiently dense, in both moist and dry locations. , Absent from salt marshes.

LOCALITY RECORDS.—

Piedmont Plateau.—Collegeville (Fox); Mt. Airy (Fox); Germantown (Fox).

Ft. Lee (Beutenmüller); New Brunswick (Grossbeck); Trenton (N. J. St. Mus. Rep.).

Middle District.—Cornwalls (Rehn); Philadelphia (J. B. Smith, Rehn); Tinicum (Rehn and Hebard); Elmwood, in Tinicum meadows (Fox); Newcastle (Fox).

Lahaway (N. J. St. Mus. Rep.); Riverton (Viereck); Washington Park (Fox); Westville (Johnson); Merchantville (Daecke); Lucaston (Daecke); Sewell (Dickerson).

Pine Barrens.—Lakehurst (Davis); Belleplain (Fox).

Coastal District.—Ocean View (Fox); Sea Isle City (Haim); Avalon, scarce (Fox); Cape May (Davis, Fox).

Cape May Interior.—S. Seaville, frequent in old fields (Fox); Clermont (Fox).

C. atlanticus Bruner.

I have not recognized this species in any of my collections and am inclined to think that the name is a synonym of the preceding.

C. ensiger Harris.

GENERAL RANGE.—New England to southern New Jersey and western North Carolina, west to Ontario, northern Indiana, Minnesota and Colorado.

LOCAL DISTRIBUTION.—Apparently scarce, most frequent northward along the edge of the Appalachian District; rare in extreme southern New Jersey.

ECOLOGICAL DISTRIBUTION.—No data on hand for our region, but usually recorded as occurring in grassy meadows and swales.

LOCALITY RECORDS.—

Highlands.—Greenwood Lake (Davis).

Piedmont Plateau.—Honesdale (Pa. St. Dept. Zool.).

Ft. Lee. (Beutenmüller); New Brunswick (N. J. St. Mus. Rep.).

Middle District.—Jamesburg (Davis).

Pine Barrens (?).—Manumuskin (Daecke).

C. exiliscanorus Davis.

GENERAL RANGE.—Is definitely known from Connecticut, Long Island and New Jersey. I am not aware of any records elsewhere, but it doubtless occurs further south.²³

LOCAL DISTRIBUTION.—Apparently not very common, most frequent in the Coastal District, occasionally occurring inland in near-by parts of Middle District and Pine Barrens.

ECOLOGICAL DISTRIBUTION.—Mr. Davis informs me the species prefers a wet or swampy place. The first specimens were collected from salt marsh, but he has found it in cattail swamps in places far removed from salt marsh.

LOCALITY RECORDS.—

Middle District.—Farmingdale (Davis); Freneau (Davis).

Pine Barrens.—Lakehurst (Davis in personal letter).

Coastal District.—Hackensack meadows (Beutenmüller); Staten Island, in salt meadows on "Spartina" (Davis, N. J. St. Mus. Rep.); Dennisville (Davis).

C. lyristes Rehn and Hebard.

GENERAL RANGE.—New Jersey to Florida near the coast.

LOCAL DISTRIBUTION.—Moderately frequent in the Coastal District; occasional inland in the near-by parts of the Pine Barrens and Cape May District.

²³ In a personal letter Mr. Davis informs me that "southward the insect gets larger and the female was in consequence described as *C. bruneri* by Mr. Blatchley." If the latter is a synonym of this species it would extend its known range as far west as Indiana at least. *C. bruneri* has also been recorded from North Carolina (Sherman and Brimley).

ECOLOGICAL DISTRIBUTION.—Along the coast occurs both in true salt marsh and in the marginal (Submaritime) zones, though in my experience it is most frequent in true salt marsh, where it chiefly inhabits the tall, reedy growths of *Spartina glabra* along the tidal streams and ditches. Mr. Davis writes that he found it at Lakehurst about cranberry bogs.

LOCALITY RECORDS.—

Pine Barrens.—Lakehurst (Davis); Speedwell (Stone); Staffords Forge (Hebard).

Coastal District.—Snake Hill (Davis); Staten Island (Davis); Tuckerton (Davis); Barnegat Bay District (N. J. St. Mus. Rep.); Ocean View (Fox); Sea Isle City (Fox); Avalon (Fox); opposite Anglesea (Fox); Cold Spring (Davis, personal communication); Cape May (N. J. St. Mus. Rep.); Goshen (Fox); Dennisville (Davis).

Cape May Interior.—In a personal letter Mr. Davis does not specify any locality, but states that he has collected the species “about as far away from the salt water as it was possible for it to get on the rather narrow strip of land.”

C. nebrascensis Bruner.

GENERAL RANGE.—Records known to me include parts of southern New Jersey, southeastern Pennsylvania, Ontario, Indiana, Minnesota and Nebraska.

LOCAL DISTRIBUTION.—Rather infrequent and local, in my experience most frequent in the Delaware Valley, occasional in the Coastal District.

ECOLOGICAL DISTRIBUTION.—In swamps, frequenting rather dense, reedy growths of grasses and sedges.

LOCALITY RECORDS.—

Middle District.—Elmwood, in Tinicum meadows, in a swamp containing an almost pure growth of rice cut-grass (*Homalocenchrus oryzoides*) (Fox).

Washington Park (Fox).

Coastal District.—Sea Isle City (Haim, in N. J. St. Mus. Rep.); Cold Spring (Long); Cape May Point, in *Scirpus americanus* marsh along edge of salt marsh (Fox).²⁴

C. caudellianus Davis.

GENERAL RANGE.—I do not know of any records of the occurrence of this species outside of New Jersey.

²⁴ Mr. Davis writes me that the Lakehurst record credited to him in the State Museum Report refers to *C. lyristes* and not to *C. nebrascensis*. Its inclusion under the latter was an error.

LOCAL DISTRIBUTION.—According to Davis, this species is frequent in the Coastal District. It appears to occur inland occasionally in the Pine Barrens.²⁵

ECOLOGICAL DISTRIBUTION.—According to a personal communication from Mr. Davis, this species occurs in the same kind of situations as *C. lyristes*. On one occasion he adds that he took a considerable number in a rather dry field (Tuckerton).

LOCALITY RECORDS.—

Pine Barrens.—Jamesburg (Davis); Lakehurst (Davis).

Coastal District.—Tuckerton (Davis); (? Ocean View, Fox); Cold Spring (Davis).

C. palustris Blatchley.

GENERAL RANGE.—Probably an Austral species, recorded, to my knowledge, from New Jersey, southeastern Pennsylvania, North Carolina and Indiana.

LOCAL DISTRIBUTION.—Not common; Middle and Coastal Districts, seemingly more frequent in the former.

ECOLOGICAL DISTRIBUTION.—Occurs in open fresh-water swamps in locations similar to those frequented by *C. nebrascensis*.

LOCALITY RECORDS.—

Middle District.—New Brunswick (N. J. St. Mus. Rep.); Trenton, in Delaware River swamp (Davis, in personal letter).

Philadelphia Neck (Wenzel, A. N. S); Elmwood, in Tinicum meadow, in a soggy spot covered with dense growth of cut rice-grass (Fox); Tinicum (Rehn).

Coastal District.—Dennisville (Davis), edge of salt marsh (personal letter).

C. fuscostriatus.

GENERAL RANGE.—Extreme southern New Jersey to North Carolina, Georgia and Texas.

LOCAL DISTRIBUTION.—One individual taken by Henry W. Fowler, Oct. 24th, 1909 at Town Bank, Cape May Co. (A. N. S.).

ORCHELIMUM Serv.

O. vulgare Harris (= *Agile* De Geer).

GENERAL RANGE.—Canada to Florida and Texas, west to the Great Plains.

²⁵ After examining some specimens of this species kindly sent me by Mr. Davis, I am almost certain that I have taken the same species at Ocean View in Cape May County. At the time I received Mr. Davis' specimens I had already donated my own collections to the Philadelphia Academy and removed to Indiana, and was therefore unable to directly verify my suspicions by comparing my material with determined specimens sent by Mr. Davis. Some of the specimens in my collection which I have labelled *lyristes* will, I think, prove to be *caudellianus*.

LOCAL DISTRIBUTION.—Abundant throughout except in the Pine Barrens, where it appears to be rather local.

ECOLOGICAL DISTRIBUTION.—Typical of open, moist grassland where there is an abundance of succulent grasses; not infrequent in grassy and weedy uplands. Exceptional in sphagnum bogs and absent from salt marsh.

LOCALITY RECORDS.—

Appalachian District.—Blairsville (Pa. St. Dept. Zool.).

Piedmont Plateau.—Harrisburg (Pa. St. Dept. Zool.); Perkasio (Fox); Collegeville (Fox); Ft. Washington (Fox); Mt. Airy (Fox); Germantown (Fox); Fern Hill (Rehn and Hebard); Castle Rock (Rehn and Hebard); Pink Hill (Fox).

Delaware Valley.—Cornwalls (Rehn); Elmwood (Fox); Paschalville (Fox); Essington (Fox).

Delair (Daecke); Lucaston (Daecke); Washington Park (Fox); Westville (Viereeke); Clementon (Fox); Jericho (Fox); Canton (Fox).

Pine Barrens.—Atsion (Hebard); near West Creek (Rehn); Belleplain (Fox).

Coastal District.—Ocean View, common in sandy uplands in denser grasses and grassy thickets, also in boggy depressions and in low grounds adjoining the salt marsh (Fox); Sea Isle City (Haim); Avalon, marshy hollows in the dune areas (Fox); Piermont (Fox); Cape May Court House (Fox); Anglesea (N. J. St. Mus. Rep., Fox); Cape May (N. J. St. Mus. Rep., Fox); Goshen (Fox); Dennisville (Davis).

Cape May Interior.—Sea Isle Junction (Fox); Ocean View Cemetery (Fox); Swain (Fox); Bennett (Fox).

O. glaberrimum Burm.

GENERAL RANGE.—Apparently co-extensive with the preceding.

LOCAL DISTRIBUTION.—Appears to be rather rare. Probably local, associated more or less with the preceding of which it may be a mere variety (see Blatchley, Orth. of Ind., p. 385).

ECOLOGICAL DISTRIBUTION.—The only specimens I have taken were found in a peat bog where they frequented chain-fern (*Woodwardia virginica*) areas.

LOCALITY RECORDS.—

Appalachian District.—Rockville (Pa. St. Dept. Zool.).

Piedmont Plateau.—Ft. Lee (Beutenmüller).

Pine Barrens.—Between Winslow and Folsom (Fox); Parkdale (Rehn and Hebard).

Coastal District.—Anglesea (Wenzel, from N. J. St. Mus. Rep.).

O. erythrocephalum Davis.

GENERAL RANGE.—New Jersey to eastern North Carolina.

LOCAL DISTRIBUTION.—Frequent in the Pine Barrens, possibly extending a little into the Middle and Coastal Districts.

ECOLOGICAL DISTRIBUTION.—Apparently restricted to sphagnum bogs, where it frequents the dense growth of chain fern, tall sedges, rushes and associated plants.

LOCALITY RECORDS.—

Pine Barrens.—Helmetta (Davis); Jamesburg (Davis); Lakehurst (Davis); New Lisbon (Smith); Lahaway (Smith); Browns Mills Junction (Daecke); Atsion (Hebard); Parkdale (Rehn and Hebard); Manumuskin (Fox); Belleplain (Fox); Great Cedar Swamp near Sea Isle Junction (Fox); Great Cedar Swamp near Dennisville (Fox).

? *Coastal District*.—Toms River (Davis); Tuckerton (Davis).

O. herbaceum Serv.²⁶

GENERAL RANGE.—Massachusetts to Texas, along the coast.

LOCAL DISTRIBUTION.—Common along the edges of the salt marshes in the Coastal District; occasionally occurring inland in the Pine Barrens.

ECOLOGICAL DISTRIBUTION.—Characteristic of the zone of *Scirpus americanus* along the edges of the salt marshes; much less frequent in other parts of the Submaritime area. I have no information concerning its Pine Barren habitats.

LOCALITY RECORDS.—

Middle District.—Newcastle, in *Scirpus americanus* (Fox).

Canton (Fox).

Pine Barrens.—Brookville (Davis acc. N. J. St. Mus. Rep.); Da Costa (Daecke acc. N. J. St. Mus. Rep.); Speedwell (Stone acc. N. J. St. Mus. Rep.).

Coastal District.—Spray Beach (Long); Atlantic City (Rehn); Sea Isle City (Haim, Fox); Townsend Inlet (Fox); Ocean View (Fox); Avalon (Fox); Piermont (Fox); Anglesea (Wenzel, Fox); Cold Spring (Fox); Cape May (Fox); Goshen (Fox); Dennisville (Davis, Fox).

O. pulchellum Davis.

GENERAL RANGE.—New Jersey to eastern North Carolina.

LOCAL DISTRIBUTION.—Apparently scarce, probably local throughout the Middle and Coastal districts and in the Pine Barrens.

²⁶ I am inclined to think that all N. J. specimens referred to *indianense* really belong to this species, at least, so far as coastal material is concerned.

ECOLOGICAL DISTRIBUTION.—The only individuals taken by me were found in a sphagnum bog in an open spot bordering dense woods. Some of the locality records would, however, indicate that it occurs in other types of swamps as well.

LOCALITY RECORDS.—

Middle District.—Trenton (Grossbeck); Tinicum (Hebard).

Pine Barrens.—Clementon (Rehn); Helmetta (Davis); Great Cedar Swamp near Sea Isle Junction (Fox); Dennisville (Davis).

O. spinulosum Redt.²⁷ (= ? *validum* Wlk.) (= ? *gracile* auct. non. Harris).

GENERAL RANGE.—Uncertain; has been recorded from North Carolina.

LOCAL DISTRIBUTION.—Frequent locally throughout, except in the Pine Barrens, which it barely enters.

ECOLOGICAL DISTRIBUTION.—In open grassy or sedgy swamps; especially frequent in swamps dominated by *Homalocenchrus oryzoides*.

LOCALITY RECORDS.—

Piedmont Plateau.—Collegeville, frequent in moist depressions in meadows (Fox); Castle Rock (Rehn and Hebard); Chestnut Hill (Hebard).

Middle District.—Cornwalls (Rehn and Hebard); Tinicum (Hebard); Elmwood, abundant in *Homalocenchrus oryzoides* at edge of Tinicum marshes (Fox); Paschalville, in Tinicum meadows (Fox).

Riverton (N. J. St. Mus. Rep.); Lucaston (Daecke); Gloucester (Hardenberg); Clementon (Greene); Jericho, in stream meadow (Fox); Canton (Fox); Dorchester, tidal swamps along Maurice River (Fox).

? *Pine Barrens*.—Belleplain (Daecke, Fox), frequent in the wettest parts of an extensive bog, in a tall species of *Juncus*, apparently *canadensis* (Fox).

Coastal District.—West Creek (Rehn); Ocean View, local in fresh meadows and in the Submaritime zone (Fox); Sea Isle City (Haim, Fox); Avalon (Fox); Piermont, in swampy depressions in the dune

²⁷ It is possible that there may be two or three species included under this name. Typical specimens from Tinicum agree closely with some in the A. N. S. marked *spinulosum*; others again differ slightly in coloration, and some of these were tentatively referred to the little understood *gracile* as used by authors, not the *gracile* of Harris, which is a synonym of *Xiph. fasciatum*. At Belleplain I captured specimens resembling my Tinicum *spinulosum*, but with a less distinct ruddy tinge on the tegmina. These are probably the species called *validum* in the N. J. St. Mus. Rep. They all come close to *O. nigripes* Scudder, but differ from it in lacking the characteristic black tibiae of the latter.

area, frequenting *Scirpus americanus* and associated plants (Fox); Anglesea (Fox); Cape May (Fox); Goshen (Fox).

O. campestre Blatchley.

GENERAL RANGE.—Rather uncertain; described from Indiana and since reported, to my knowledge, from Minnesota and New Jersey.

LOCAL DISTRIBUTION.—Probably scarce, reported, so far as I am aware, only from the Coastal District.

ECOLOGICAL DISTRIBUTION.—Have no local data. In Indiana, according to Blatchley, it occurs "in the tall grasses of low prairie meadows."

LOCALITY RECORDS.—

Coastal District.—Tuckerton (N. J. St. Mus. Rep.); Cape May (N. J. St. Mus. Rep.).

O. minor Bruner.

GENERAL RANGE.—Occurs, so far as I have been able to find records, in New Jersey, North Carolina and Georgia.

LOCAL DISTRIBUTION.—Apparently rather uncommon; most regular in the Pine Barrens, occasional in the Middle District.

ECOLOGICAL DISTRIBUTION.—An arboreal species, reported as occurring on pine (N. J. St. Mus. Rep.).

LOCALITY RECORDS.—

Middle District.—Delair (N. J. St. Mus. Rep.).

Pine Barrens.—Helmetta (Davis); Jamesburg (Davis); Lakehurst (Davis); Browns Mills Junction (Daecke); Atsion (Hebard); Staffords Forge (Hebard).

O. fidicinium Rehn and Hebard.

GENERAL RANGE.—So far as known, includes from New Jersey to Florida along the coast.

LOCAL DISTRIBUTION.—Common in suitable locations in the Coastal District.

ECOLOGICAL DISTRIBUTION.—Characteristic of the tall, reedy growths of *Spartina glabra* along watercourses in the salt marshes. Apparently a purely halophilous species.

LOCALITY RECORDS.—

Coastal District.—Staten Island (Davis); Tuckerton (Davis); Chestnut Neck, Atlantic Co. (Rehn); Ocean View (Fox); Sea Isle City (Fox); Townsend Inlet (Fox); Avalon (Fox); Piermont (Fox); Anglesea (Rehn); Goshen (Fox).

XIPHIDIUM Serville (= *Conocephalus* Thunb.).**X. fasciatum** De Geer.

GENERAL RANGE.—Very widely distributed from Canada to the Gulf, and, according to Redtenbacher, as cited by Blatchley, through South America to Argentina.

LOCAL DISTRIBUTION.—Abundant in suitable locations in the Middle and Coastal Districts; frequent, but rather local, in the Piedmont Region. In my experience it is uncommon in the Pine Barrens.

ECOLOGICAL DISTRIBUTION.—Most typical of low, moist areas overgrown with low, succulent grasses, sedges and rushes; especially plentiful in the *Juncus gerardii* zone along the edges of the salt marsh, but not normally found on true salt marsh. Occasionally found in quite dry situations, as in hillside pastures where there is a good growth of the low rush, *Juncus tenuis*.

LOCALITY RECORDS.—

Piedmont Plateau.—Harrisburg (Pa. St. Dept. Zool.); Rockville (Pa. St. Dept. Zool.); Camphill (Pa. St. Dept. Zool.); Rock Hill (Fox); Perkasio, on pastured hillside in *Juncus tenuis* (Fox); Collegeville, in stream meadows (Fox); Mt. Airy, in small grassy bog (Fox); Pink Hill (Fox); Swarthmore (A. N. S.).

Middle District.—Cornwalls (Rehn and Hebard); Elmwood, in Tinicum meadows (Fox); Paschalville, in Tinicum meadows (Fox); Essington (Fox); Newcastle (Fox).

Washington Park (Fox); Blackwood (Fox); Medford (Stone); Clementon (Fox); Jericho, in stream meadow (Fox); Canton (Fox); Dorchester (Fox).

Pine Barrens.—Taunton (Stone); Penbryn, rare on cranberry bog (Fox); Atsion (Fox).

Coastal District.—West Creek (Rehn); Chestnut Neck, Atlantic Co. (Rehn); Petersburg (Fox); Tuckahoe, low lands along river (Fox); Ocean View (Fox); Sea Isle City (Fox); Townsend Inlet (Fox); Avalon (Fox); Piermont (Fox); Cape May (Fox); Cape May Point (Fox); Goshen (Fox); Dennisville, edge of salt marsh (Fox).

Cape May Interior.—Sea Isle Junction, edge of Great Cedar Swamp, scarce (Fox).

X. brevipenne Scudder.²⁸

GENERAL RANGE.—Canada to the Gulf of Mexico, east of the Plains.

²⁸ Includes *X. ensiferum* Scudd.

LOCAL DISTRIBUTION.—Common in suitable locations in the Appalachian and Piedmont Districts; frequent, but rather more local in the Middle and Coastal Districts. Relatively infrequent or local in the Pine Barrens. Apparently absent from the beaches.

ECOLOGICAL DISTRIBUTION.—Most typical of wet or humid areas covered with dense, succulent grasses; less frequent on dry ground in dense, grassy thickets. Does not normally occur in salt marshes, nor in *Juncus gerardi* and *Scirpus americanus* zones of the Submarine areas, but inhabits the more succulent, grassy tracts at places where the Submarine area merges into the upland.

LOCALITY RECORDS.—

Appalachian District.—Rockville (Pa. St. Dept. Zool.).

Piedmont District.—Harrisburg (Pa. St. Dept. Zool.); Marysville (Pa. St. Dept. Zool.); Dauphin (Pa. St. Dept. Zool.); Collegeville, in damp meadows, ditches, pond borders, etc. (Fox); Valley Forge (Fox); Ashbourne (Long); Mt. Airy (Fox); Germantown (Fox); Fern Hill (Rehn and Hebard); Castle Rock (Rehn and Hebard); Pink Hill, in stream meadow (Fox).

Middle District.—Cornwalls (Rehn and Hebard); West Philadelphia (Long); Elmwood, in Tinicum meadows (Fox); Paschalville (Fox).

Riverton (Viereck); Washington Park (Fox); Woodbury (Viereck); Jericho, in grasses along narrow gutter in sandy barrens (Fox); Canton (Fox); Manumuskin, on *Zizania* on tidal flats (Fox); Medford (Rehn).

Pine Barrens.—Taunton (Rehn); Atsion (Rehn); Staffords Forge (Rehn); Belleplain, in small cranberry bog, not common (Fox); Mt. Pleasant, occasional in undergrowth of oak and pine woods (Fox); Formosa Bog (Fox).

Coastal District.—West Creek (Rehn); Petersburg, tract of succulent grass above tidal meadows (Fox); Ocean View, local, in succulent, grassy spots just above the salt marsh (Fox); Goshen, tall grass, lowlands just above salt marsh (Fox); Dennisville, grassy thickets, edge of the woods (Fox); Cold Spring, in low, grassy tangles bordering *Scirpus americanus* swamp (Fox); Cape May Point, lake margin (Fox).

X. nemorale Scudder.

GENERAL RANGE.—Appears to be largely northern, extending from New York to Minnesota and Nebraska, south to central Pennsylvania and the Ohio River, in the mountains to North Carolina.

LOCAL DISTRIBUTION.—Apparently rare and very local, occurring

only in the extreme northern part of New Jersey and not extending much south of the lower limits of the Appalachian Region of Pennsylvania.

ECOLOGICAL DISTRIBUTION.—I know of no record of its habitats in our region. According to Lugger, it prefers the borders of forests, frequenting the low bushes in such locations. In Indiana I have found it in similar situations.

LOCALITY RECORDS.—

Piedmont Plateau.—Highspire (Pa. St. Dept. Zool.); Middletown (Pa. St. Dept. Zool.).

Eastern slope of the Palisades (Beutenmüller).

X. strictum Seudder.

GENERAL RANGE.—Largely Austral in range, extending from New Jersey to Texas, north in the interior to Illinois, Minnesota and Nebraska.

LOCAL DISTRIBUTION.—Locally not infrequent in the Piedmont Plateau; quite common in the lower half of the Middle District and the Coastal Strip, rare or accidental on the beaches. Apparently very local in cultivated sections of the Pine Barrens.

ECOLOGICAL DISTRIBUTION.—A xerophilous species, characteristic of dry, open grasslands.

LOCALITY RECORDS.—

Piedmont Plateau.—Harrisburg (Pa. St. Dept. Zool.); Valley Forge (Fox); Mt. Airy (Daecke); Ashbourne (Long); Fern Hill (Rehn and Hebard); Castle Rock (Rehn and Hebard); Pink Hill, in grass on dry hillsides (Fox).

Middle District.—Cornwalls (Rehn and Hebard); Elmwood, in Tinicum meadows, frequenting dry, grassy areas (Fox); Paschalville (Fox); Essington (Fox).

Washington Park, sandy areas in bunch grasses, etc. (Fox); Almonesson, in open, sandy field, frequenting grassy thickets (Fox); Canton, dry, grassy uplands near salt marsh (Fox).

Pine Barrens.—Taunton (Stone); Atsion (Hebard); head of Tuckahoe River (Fox).

Coastal District.—Staten Island (Davis); Petersburg (Fox); Ocean View, common in upland situations in coarse grasses and weeds (Fox); Avalon, 1 female, no others observed (Fox); Cape May, scarce, noted only one individual (Fox); Cape May Point (Fox); Goshen (Fox).

Cape May Interior.—Sea Isle Junction, in grassy scrub (Fox); Ocean View Cemetery (Fox); S. Seaville, mostly in old fields and in

roadside vegetation (Fox); near Dennisville (Fox); Clermont (Fox).

X. saltans Scudder.

GENERAL RANGE.—Canadian Provinces to the Gulf States, west to Minnesota, Nebraska and Kansas.

LOCAL DISTRIBUTION.—Apparently quite rare and local; has been taken locally in all districts, except Appalachian and Highlands. I know of no records of its occurrence on the beaches.

ECOLOGICAL DISTRIBUTION.—On the single occasion when I encountered this species I found it on dry uplands in grassy tangles like those frequented by the preceding species.

LOCALITY RECORDS.—

Piedmont Plateau.—Fern Hill (Rehn and Hebard).

Middle District.—Cornwalls (Rehn and Hebard).

Riverton (Viereck).

Pine Barrens.—Browns Mills Junction (Daecke); Atsion (Hebard).

Coastal District.—Ocean View, rare (Fox).

X. spartinae Fox.

GENERAL RANGE.—Southern Massachusetts to New Jersey and probably to Florida along the coast.

LOCAL DISTRIBUTION.—Abundant in the Coastal District on salt marshes; occasional inland along tidal streams.

ECOLOGICAL DISTRIBUTION.—Characteristic of salt marshes, where it frequents the short variety of *Spartina glabra* that covers the tidal flats between the watercourses. Less frequent in the Submaritime zone. Doubtless extends inland in small numbers along tide-water streams as one was taken in the rice grass (*Zizania*) on tidal flats of Manumuskin Creek.

LOCALITY RECORDS.—

Middle District.—Canton, edge of salt marsh (Fox); Manumuskin, in *Zizania* (Fox).

Coastal District.—Atlantic City, salt marsh (Rehn, originally reported as "*nemorale*" and later as "*brevipenne*," see Ent. News, 1902 and 1904); Palermo (Fox) in salt marsh; Ocean View, salt marsh (Fox); Sea Isle City (Fox); Avalon (Fox); Piermont (Fox); Anglesea (Fox); Cape May (Fox); Dennisville, salt marsh (Fox).

X. nigropleuroides Fox.

GENERAL RANGE.—New Jersey to Florida along the coast.

LOCAL DISTRIBUTION.—Frequent in salt marshes, to which it is apparently restricted.

ECOLOGICAL DISTRIBUTION.—Characteristic of the reed-like fringes of *Spartina glabra* along the watercourses, in which it is associated with *Orchelimum fidicinium*.

LOCALITY RECORDS.—

Coastal District.—Ocean View (Fox); Townsend Inlet (Fox); Avalon (Fox); Piermont (Fox); Goshen (Fox); between Goshen and Dennisville (Fox).

ATLANTICUS Seudder.

A. dorsalis Burm.

A. pachymerus Burm.

GENERAL RANGE.—New England to the Gulf States, west to Minnesota.

LOCAL DISTRIBUTION.—Moderately frequent in suitable locations in all districts, except the Cape May Peninsula and the beaches, in which it is either rare or lacking.

ECOLOGICAL DISTRIBUTION.—Sylvan, frequenting the undergrowth of open woodlands.

LOCALITY RECORDS.—

Highlands.—Greenwood Lake (Beutenmüller); Newfoundland (Davis).

Piedmont Plateau.—Ashbourne (Long); Guthriesville (Rehn and Hebard); Newtown Square (Rehn and Hebard).

Middle District.—Woodbridge (Davis); Jericho (Fox).

Pine Barrens.—Lakehurst (N. J. St. Mus. Rep.); Lahaway (N. J. St. Mus. Rep.); Browns Mills Junction (Daecke); Staffords Forge (N. J. St. Mus. Rep.).

Coastal District.—Tuckerton (Davis); Dennisville (Davis).